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August 1956

# Agriculture

VOL. LXIII - No. 5

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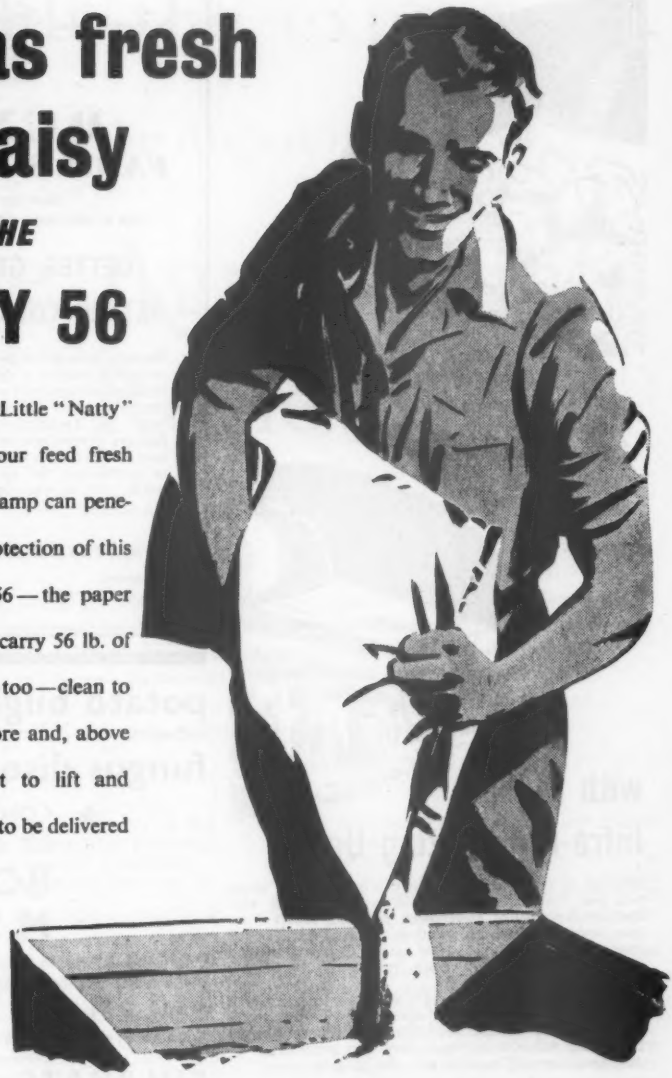

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*Milk*—Professor H. D. Kay, Director of the National Institute for Research in Dairying, examines the milk producers' headaches—composition and quality, solids, not fats, v. butterfat content.

*Workers' Incentives.* One serious problem for farmers is preventing their men from straying into industry. In our August issue V. M. Green of the British Productivity Council examines the pros and cons of various incentives such as free housing, piece work and profit-sharing schemes.

*Scrapie Disease.* Another article, by Dr. J. T. Stamp of the Edinburgh Animal Diseases Research Association reviews very thoroughly scrapie disease amongst sheep.

*Fruit Spraying.* A topical subject in August is fruit, and J. H. Stapley of Fernhurst Research Station contributes an article on low volume techniques of tree spraying.

*Husk* is discussed in an article by W. F. H. Jarrett, W. I. M. McIntyre and G. M. Urquhart of Glasgow University. They deal fully with the lung worm, and how this cattle disease can be controlled.

In addition to research abstracts there are summaries of annual research reports from the National Vegetable Research Station, East Malling, the John Innes Horticultural Institution, and the Rowett Institute, Aberdeen.

These are only some of the important articles in the August issue. There are also the regular monthly features—book reviews, conference reports, etc., and a comprehensive economic review prepared by the Economist Intelligence Unit. The August Agricultural Review is now on sale.

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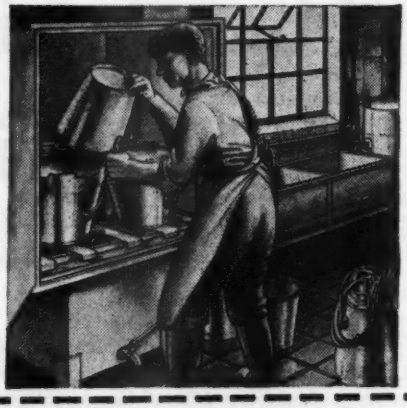

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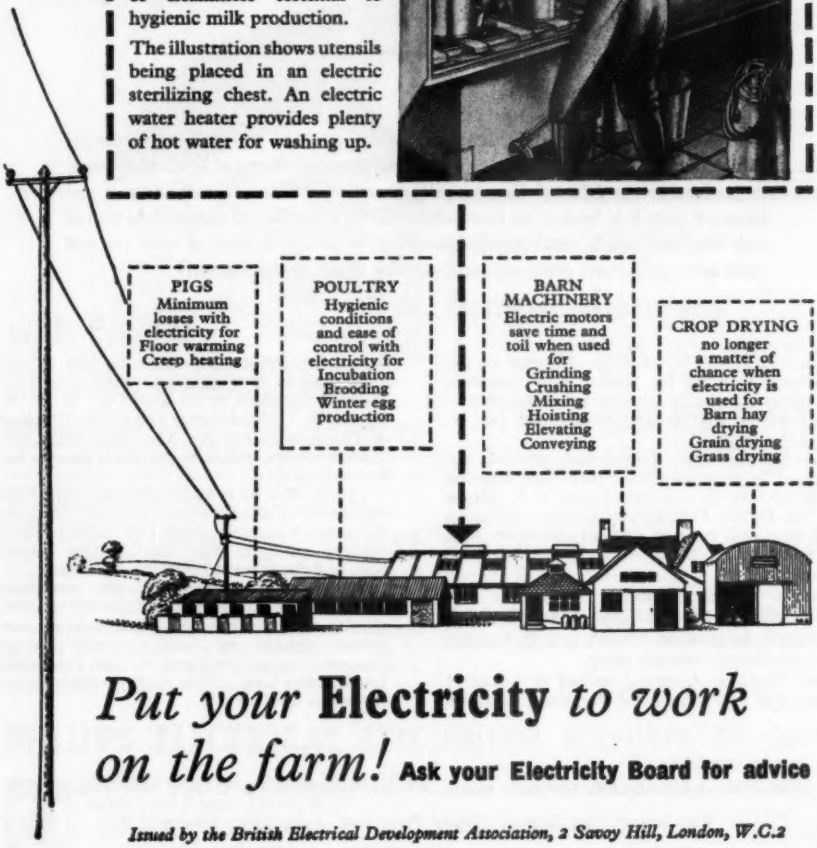

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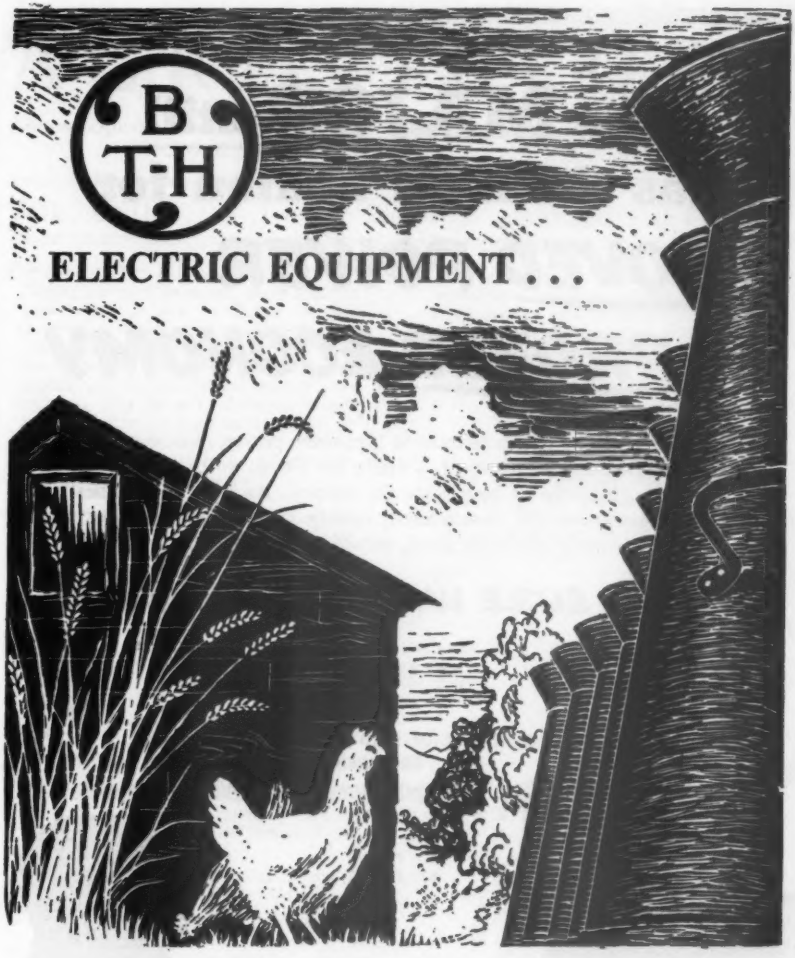


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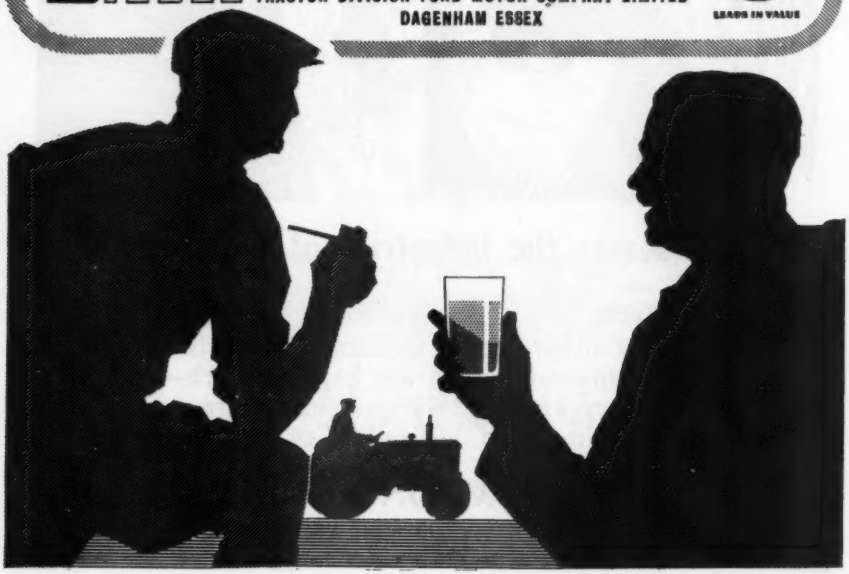

# AGRICULTURE

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VOL. LXIII No. 5 AUGUST 1956

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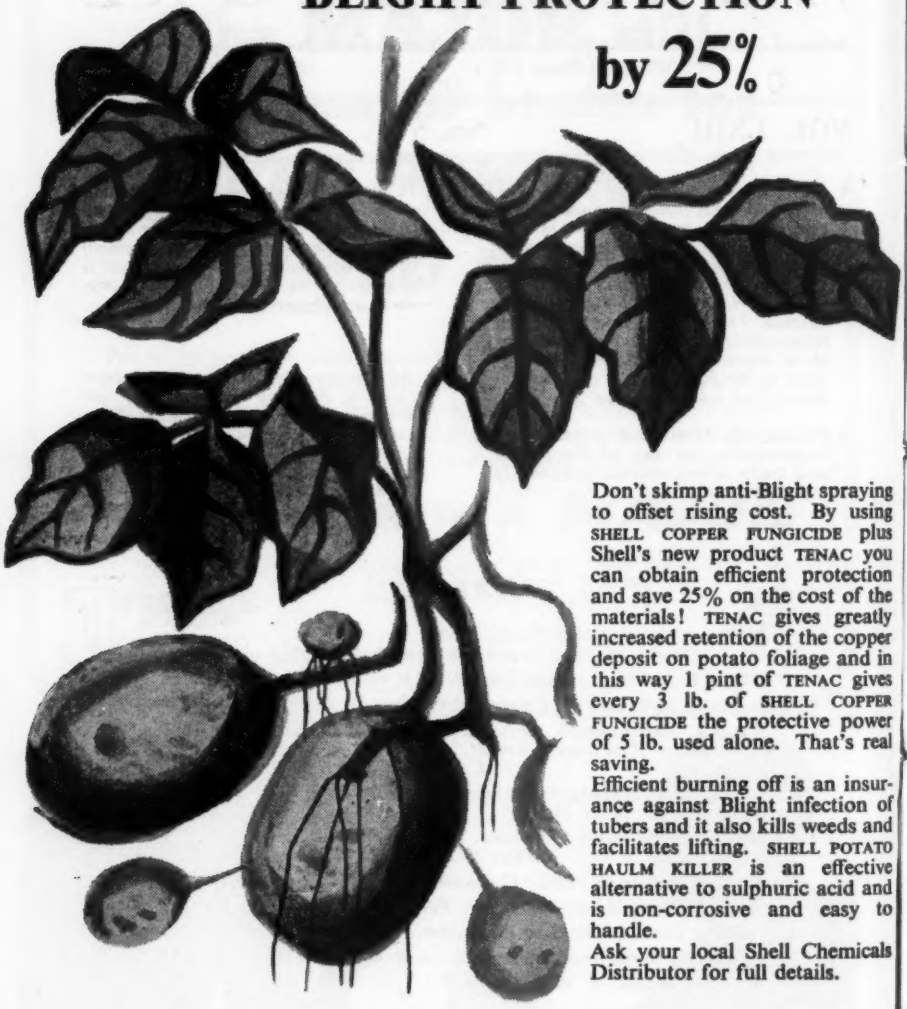

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# AGRICULTURE

VOL. LXIII No. 5 AUGUST 1956

## WINTER OR SUMMER MILK PRODUCTION?

V. H. BEYNON, B.Sc., and J. A. LANGLEY, M.Sc.

*Department of Economics, University of Bristol*

**No dogmatic statement can be made about the relative profitability of winter and summer milk production because of the number of variables involved. But the writers explain how the individual farmer can set about assessing the most profitable system in his own case.**

WHAT are the factors which determine the seasonal milk production pattern on farms, and how many of these are under the farmer's control? The pattern largely depends on the proportion of cows calving down at different periods of the year. If the cows calve regularly every twelve months it remains fairly constant, but this is rarely achieved in practice because calving programmes depend on conception rates which are rather unpredictable. The farmer can influence the pattern by delaying the service or insemination of some cows so that they calve at a later date the following year, or he can bring in purchased or home-reared replacements at chosen periods of the year. In the short run, the calving pattern is only partly under the farmer's control—it may take several years to change the calving schedule in an existing herd without sacrificing some production.

Over the past few years, the increasing proportion of milk produced during the winter suggests that production is more profitable during this season. However, with each price adjustment in favour of summer production, an increasing number of farmers are wondering whether their existing systems are the most profitable. It is unwise to generalize about any farming system because of the wide ranges, not only in the resources available on farms, but also in the climatic and other natural conditions. Each farmer has to decide, in the light of his own particular circumstances, the policy most likely to lead to maximum profits. In determining the seasonal milk production policy, he should consider the main factors likely to influence the position. They are: (1) yield per cow, (2) seasonal milk prices, (3) supplies of home-grown feed, (4) density of stocking, and (5) cost of purchased feed.

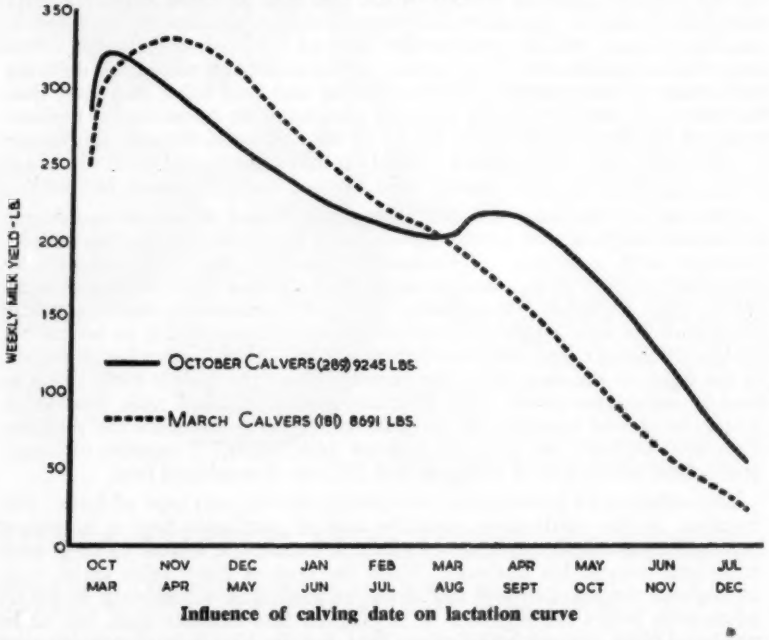
The influence of these factors varies with the size and type of farm. For instance, on the small dairy farm the cost of purchased feed is important because considerable quantities are used to enable the farmer to keep more cows and expand his business. Since the cost of dairy cake varies little throughout the year, it pays the farmer to feed most of the cake in winter when milk prices are highest. It is claimed that summer milk has to be produced from cheaper home-grown feed, but the high rate of stocking with dairy cows—a feature of the small farm—makes this difficult, since the quantity of home-grown feed available per cow is limited. There are, then, advantages in a winter milk policy on the small dairy farm.

## WINTER OR SUMMER MILK PRODUCTION?

On large arable farms with subsidiary dairy enterprises, the supply of home-grown feed is likely to be a dominant factor. A winter milk policy suits such farms because arable crop by-products are used for winter feed, better use is made of the regular labour force, and the cows are not likely to suffer much from drought conditions in the summer when they are drying off.

It is on the larger farms in the western half of the country that the problem of seasonality of milk production is more pertinent. Farmers on such holdings have to bear in mind all the factors listed above in choosing the most desirable policy for their particular circumstances. The effect of such factors should be estimated and a budget prepared showing the profit likely from a particular pattern of seasonality. Such a budget is set out later, using average standards of performance for the South-West.

**Yields and Prices** It is generally recognized that under similar conditions an autumn calver gives a higher yield than a spring calver. This is illustrated by a Milk Marketing Board report,* which shows the influence of month of calving on yields and the shape of the lactation curves. The graph below is derived from this report and summarizes data for two groups of milk-recorded cows, one group calving in March and the other in October. The information has then been used: (a) at yield levels nearer the national average; and (b) for cows calving in April and not March, to obtain the monthly milk output for an April calver yielding 680 gallons and an October calver giving 700 gallons.




**Influence of calving date on lactation curve**

Monthly pool prices for the Far-Western M.M.B. region for 1955 ranged from 2*s.* 0½*d.* per gallon in May and June to 3*s.* 9*d.* in January. These

* *Report No. 1 of the Production Division, M.M.B.* 1950, p. 21.

prices have been used in calculating the total value of the milk sold from the April and October calving cows. The total value amounts to £91 in the case of the 680-gallon cow, and £111 for the 700-gallon cow—a difference of £20.

**Use of Home-grown Foods** In preparing the budget, it is assumed that each cow requires 2¼ acres of grassland—1¼ acres being grazed and 1 acre cut for hay—and that dairy cake is bought for all additional requirements. The production levels achieved from grazing, as well as the quantities of purchased feed necessary during both seasons, are set out in Table 1.

**Table 1**

**Grassland Contribution and Purchased Feed Requirements**

| | Possible Performance from Grassland (both cows) | | April Calver | | | October Calver | | |
|---|---|---|---|---|---|---|---|---|
| | Grazing | Hay | Total Yield (gal) | Gallons produced from Grass | Gallons produced from P/Feed | Total Yield (gal) | Gallons produced from Grass | Gallons produced from P/Feed |
| January | — | M | 14 | — | 14 | 76 | — | 76 |
| February | — | M | — | — | — | 64 | — | 64 |
| March | — | M | — | — | — | 70 | — | 70 |
| April | M+2 | — | 104 | 60 | 44 | 70 | 60 | 10 |
| May | M+3 | — | 110 | 90 | 20 | 62 | 62 | — |
| June | M+3 | — | 103 | 90 | 13 | 45 | 45 | — |
| July | M+2¼ | — | 87 | 75 | 12 | 29 | 29 | — |
| August | M+2 | — | 77 | 60 | 17 | — | — | — |
| September | M+1 | — | 68 | 30 | 38 | — | — | — |
| October | ¼M | ¼M | 54 | — | 54 | 104 | — | 104 |
| November | — | M | 40 | — | 40 | 94 | — | 94 |
| December | — | M | 23 | — | 23 | 86 | — | 86 |
| | M+405 gallons | | 680 | 405 | 275 | 700 | 196 | 504 |

(M = Maintenance)

It is assumed that grazing makes its greatest contribution—that is, maintenance and the production of 3 gallons per day—during May and June, and that it provides little from the middle of October to the end of March. Many farmers would claim that they are getting far better performances than this, but the data set out in Table 1 refer to average performances on dairy farms in this country.

It would appear that the April calver requires dairy cake for 275 gallons and the October calver cake for 504 gallons. At £35 per ton and fed at the rate of 4 lb per gallon, the purchased feed costs per cow would be £17 and £31 respectively. The additional value of the milk obtained from the winter calver amounts to £20 and is produced at an additional purchased feed cost of £14. Therefore, the October calver earns a margin over feed costs which is £6 higher than that of the April calver.

The table suggests that the October calver is not making full use of the potential production from grassland. It should be possible to confine this cow to a smaller acreage of grazing in spring and summer, when drying off, thus releasing land to provide grass silage or other feed to replace dairy cake during the winter. The effects on the budget of two alternative cropping programmes for a winter-producing herd is shown overleaf. (For convenience, the new cropping proposals are set out on the basis of a 20-cow herd.)

Still keeping the land under grass but confining the herd to fewer grazing

acres, it would be possible to ensile part of the grass. The land use for October calvers is now as follows:

| | Acres per Cow | Acres per 20-Cow Herd |
|---|---|---|
| Grazing ... ... ... ... | ¾ | 15 |
| Hay ... ... ... ... ... | 1 | 20 |
| Silage ... ... ... ... ... | ½ | 10 |
| Total ... ... ... ... | 2¼ | 45 |

With a smaller acreage of grazing, the milk obtained from grass during the spring and summer is likely to be reduced. (For the purposes of this study it is assumed that the yields are three-fifths of those previously set out.) The hay still provides a maintenance diet in the winter, and the silage from ½ acre should suffice for the production of 1 gallon of milk a day during the six winter months. Under this new use of the land, dairy cake is required for 341 gallons instead of 504 gallons, and the cost of purchased feed is reduced from £31 to £21. The extra cost of making 10 acres of silage, calculated to be £34, has to be taken into account. The margin over feed cost is now £14 per cow higher in the case of the October calver, rather than the £6 estimated earlier.

The budget can be varied still further to show the effect of growing 5 acres of silage and 3 acres of kale instead of the 10 acres of silage envisaged above. (In this instance, 2 acres would be returned to grazing.) It is assumed that the kale is fed for the three months before Christmas and the silage for the first three months in the New Year. For a 20-cow herd, 3 acres of kale should provide each cow with 60 lb each day for three months—sufficient for the production of 1½ gallons of milk daily. Taking into account the additional costs of silage and kale (£39) and the cake replaced, the margin over feed costs is now £15 higher in the case of the October calver.*

**Density of Stocking** The same rate of stocking has been assumed throughout for both winter and summer milk production. To equal the margins earned by the winter producers using silage, or silage and kale, the summer producers would have to carry 20 per cent more cows. This heavier stocking rate is unlikely. Indeed, the probability is that the heavier stocking rates are found on farms producing most of the milk during the winter months.

**Effect of Changes in Prices and Costs** The way in which changes in the price of milk and in the cost of dairy cake affect the relative profitability of winter and summer production is shown in Table 2.

A reduction of 1*d.* per gallon in the price of winter milk reduces winter margins by £1 10*s.* per cow at the yield levels assumed here. When this reduction is accompanied by an increase of £10 per ton in the cost of dairy cake, the advantage of producing winter milk disappears for the producers relying entirely on dairy cake. Those using silage and kale to replace part of the cake in the production ration are not affected to the same extent by such changes. Indeed, a fall of 3*d.* per gallon in the price of winter milk, together with an increase of £10 per ton in the cost of dairy cake, reduces the extra margin by only £5 per cow, still leaving an advantage of £10.

* The advantage of winter milk producers would be further increased if the 5 acres, rather than 3 acres, could be used for kale.

**Table 2**

**Effect of Milk Prices and Feed Cost Changes according to Crops Grown**

| Price/Cost Changes | Cropping | | |
|---|---|---|---|
| | No Silage | Silage | Silage and Kale |
| | *Extra Margin Earned by 20 October Calvers* | | |
| | £ | £ | £ |
| 1955 milk prices and dairy cake at £35 per ton ... | 117 | 287 | 304 |
| *Reduction of 1d. per gallon for winter milk* and | | | |
| (a) Increase of £5 per ton for dairy cake ... ... | 46 | 245 | 270 |
| (b) Increase of £10 per ton for dairy cake ... ... | 5 | 233 | 266 |
| *Reduction of 2d. per gallon for winter milk* and | | | |
| (a) Increase of £5 per ton for dairy cake ... ... | 16 | 215 | 240 |
| (b) Increase of £10 per ton for dairy cake ... ... | −25 | 203 | 236 |
| *Reduction of 3d. per gallon for winter milk* and | | | |
| (a) Increase of £5 per ton for dairy cake ... ... | −14 | 185 | 210 |
| (b) Increase of £10 per ton for dairy cake ... ... | −55 | 173 | 206 |

**Present Advantage in Winter Production** There are many other factors which may have a profound influence on some dairy farms. For instance, some farmers may be using more than 4 lb of cake for every gallon of milk produced during the winter. Others may be getting very high milk yields off grass alone in spring and summer. Many are obtaining higher average yields from their cows than the levels assumed here. All these factors should be considered, but this article is primarily concerned with the techniques which farmers should use in assessing the effect of changes from winter to summer milk, or vice versa. The data presented suggest that, with present price-cost relationships, there is an appreciable financial advantage in winter milk production. They also suggest that where cheap home-grown feeds can be used to replace expensive bought concentrates, there would have to be a considerable adverse movement, not only in winter milk prices but also in feed costs, to outweigh the financial advantage enjoyed by the average winter milk producer.

*Note:* This article is based on *Some Economic Aspects of Seasonality in Milk Production* (Report No. 94), published by the University of Bristol, Department of Agricultural Economics, 1 Courtenay Park, Newton Abbot.

★ ***NEXT MONTH***

*Some articles of outstanding interest*

**Virus Diseases of Insects** by KENNETH SMITH of the Virus Research Unit, Agricultural Research Council, Molteno Institute, Cambridge ● **Chemical Desiccation of Red Clover for Seed** by STANLEY A. EVANS, N.A.A.S., Oxford ● **Design of Pig and Poultry Houses** by D. W. B. Sainsbury of the Royal Veterinary College and Hospital ● **Growing and Marketing Freesias** by R. L. C. FOOTIT.

# HIGHER PROFITS FROM A DAIRY FARM

G. P. CHITTY, B.Sc.

*National Agricultural Advisory Service, West Midland Province*

Almost a threefold increase in farm profit has been secured within three years on a 250-acre Worcestershire dairy farm.

THE beneficial results that can accrue from analysing farm accounts, and applying the lessons learned to farm planning, are well illustrated by a Worcestershire dairy farm of 250 acres. This farm is typical of many in the area, except that in the past three years the profit has been increased by more than 150 per cent. In 1953, it carried a herd of Friesian cows supported mainly on home-grown foods. The arable land (then 107 of the 255 acres) is wet and heavy, the sowing season is often short, and winter cereals generally do better than the spring varieties. The annual profit before the re-organization averaged about £500.

A preliminary analysis of the 1953 accounts quickly revealed that the major fault lay in the farm's low production. The dairy herd was well managed and the output per livestock unit was above average (see Table 3), but the farm was carrying only one livestock unit to 4 acres of feed crops, compared with a standard for the area of one livestock unit to 2 acres. The first task, therefore, was to increase production as quickly as possible.

But there was not much capital, and this fact had to be borne in mind in making any recommendations for improving production. The dairy building was, however, a modern one, capable of holding a maximum of 50 cows, and since there were only 35 cows in the herd during the first year, one obvious step seemed to be to increase the cow numbers. Moreover, it was decided to add a pig enterprise and aim at 10 sows, the litters of which were to be sold for pork. Table 1 shows how, by this increase in stocking, the number of livestock units on the farm was increased from 54 in 1953 to 75 in 1955, representing one livestock unit to 2.9 acres of feed crops. This was obviously a step in the right direction.

**Table 1**

**Cropping and Stocking, 1953-55**

| | 1953 | 1954 | 1955 |
|---|---|---|---|
| Arable (*acres*) ... ... ... ... | 107 | 101 | 78 |
| Leys (*acres*) ... ... ... ... | 95 | 92 | 138½ |
| Permanent pasture (*acres*) ... ... | 53 | 53 | 29½ |
| Stock (*livestock units*) ... ... ... | 54 | 71 | 75 |

In terms of actual stock, the dairy herd was first increased from 35 to 42, and then, with the addition towards the end of the three-years period of eight in-calf heifers, brought up to the maximum originally envisaged. The number of sows on the farm was increased from two to seven, and a small flock of hens was kept on deep litter.

The general policy on the arable side during these three years was to reduce the arable acreage slightly and to increase the area under leys. At the same time, rather more per acre was spent on fertilizers to try and increase crop yields. On average, between 30 and 40 acres of cereal cash crops have been grown for sale, and the remainder of the arable land has been given over to oats, beans, and kale for stock-feeding. But it has not proved possible to keep rigidly to a definite plan. For example, the wet

winter of 1954-55 necessitated reducing the acreage of oats and beans, with the result that the supply of home-grown concentrates ran out in January, and food had to be bought in. It was also impossible that year to get the wheat sown in the autumn, so that spring wheat had to be grown in its place, with a consequent reduction in yield.

**Costs and Returns** So much for the changes suggested. What did they mean in terms of profit? In 1953, the costs per acre were £20 2*s.* and the returns £22 8*s.*, leaving a profit margin of £2 6*s.* per acre. The full effects of the recommendations were not seen until the third year, when, despite a slight rise in costs, the profit amounted to £5 4*s.* per acre. The greatest single item of expenditure was wages, which remained constant over the three years at £6 14*s.* per acre.

**Table 2**

**Cost and Returns per Acre, 1953-55**

| | 1953 | 1954 | 1955 |
|---|---|---|---|
| | £ s. | £ s. | £ s. |
| Total cost ... ... ... | 20 2 | 26 8 | 26 2 |
| Total returns ... ... ... | 22 8 | 30 | 31 6 |
| Profit ... ... ... ... | 2 6 | 3 12 | 5 4 |

As I have already mentioned, the dairy herd was originally fed largely on home-grown foods, including silage: only about £2 per acre was spent on purchased foods. But the average yield of the herd was not high enough, and it was accordingly decided to spend more on bought concentrates. Thus, by 1955, food costs had risen to £6 6*s.* per acre, and although a proportion of the extra expenditure was due to the increase in pig numbers, a good deal of the extra food went to the cows. This change was more than justified by the extra production in terms of milk and pork, for whereas in 1953 the livestock and milk sales were £19 8*s.* per acre, by 1955 the figure had increased to £28 10*s.*

On the crop production side, the total returns showed a steady improvement over the three years, in spite of the fact that the sales per acre fluctuated more widely than was expected—from £3 in 1953 to £5 14*s.* in 1954, and down again to £2 16*s.* in 1955.

Throughout this improvement plan the standard figure for a mixed arable Worcestershire dairy farm, supplied by the Agricultural Economics Service at Bristol University, was used as a criterion. During the three years under review, the gross and net production per acre on this farm have continued to increase, but have still not reached the standard of £43 per acre. The gross production per livestock unit is above standard, but there is still room for an increase in the stock numbers and an intensification of the farming system.

**Table 3**

**Efficiency Factors**

| PRODUCTION | 1952-53 | 1953-54 | 1954-55 | Standard |
|---|---|---|---|---|
| | £ s. | £ s. | £ s. | £ s. |
| Gross output per acre ... ... | 22 8 | 30 | 31 6 | 43 15 |
| Net production per acre ... ... | 18 | 23 | 23 | 33 5 |
| Gross livestock production per livestock unit ... ... ... | 89 | 85 | 93 | 80 12 |
| Crop production per acre of sale crops ... ... ... ... | 32 | 42 | 30 | 47 6 |
| LABOUR | | | | |
| Gross production per £100 labour | 373 | 500 | 474 | 362 |

## HIGHER PROFITS FROM A DAIRY FARM

The labour productivity figure is very good, and the possibility of employing an extra man was investigated. In fact, one was taken on but, as another left, the labour staff has remained at two men and a boy during the three years.

**Future Plans** At the end of the third year, it was decided that the policy should be to continue expanding production while keeping the prime costs as low as possible. The main objective will be to maintain the dairy herd at its maximum of 50 cows in milk, with an average herd yield of 850-900 gallons a year. Since the buildings are not suitable for fattening bacon pigs, the sow numbers will be kept at the present level, but the farmer may possibly change over to producing a bacon type of store pig.

Sixty acres of rather drier land giving additional access to the main road have now been rented, and this will enable a flock of 50 ewes to be kept. One field has been put down to a lucerne-cocksfoot mixture sown in alternate rows, with a view to extending the grazing season and providing keep in the dry summer months.

An analysis of this sort is most useful on any farm, even if only to prove that the standard is indeed satisfactory. Where there is an obvious weakness it should not be difficult to devise for its correction a flexible farm plan which can be modified in the light of changing economic circumstances. In the particular case under review it has been well worth while, as the farm profit has increased from £500 in 1953 to £870 in 1954, and to £1,262 last year.

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## FORTHCOMING AGRICULTURAL SHOWS

| DATE | SHOW | LOCATION |
|---|---|---|
| *Aug.* 16-17 | **United Counties** | The Park, Carmarthen |
| 22-24 | **Pembrokeshire** | Haverfordwest |
| 29 | **Denbighshire and Flintshire** | Rhyl |
| 30 | **Monmouthshire** | Monmouth |
| *Aug.* 31-*Sept.* 1 | **English National Championship Sheepdog Trial** | Racecourse, Hereford |
| *Sept.* 4 | **Mid-Somerset** | Shepton Mallet |
| 6 | **Bucks County** | Aylesbury |
| 8 | **Northamptonshire** | Boughton Park, nr. Kettering |
| 13-15 | **International Championship Sheepdog Trial** | Ruthin, Denbighshire |
| 13 | **Montgomeryshire** | Welshpool |
| 13 | **Westmorland** | Kendal |
| 15 | **Brecknockshire** | Brecon |

These dates are subject to revision or cancellation.

# SEPARATED MILK FOR PIGS, CALVES AND POULTRY

C. D. RICKABY, B.Sc.

*National Agricultural Advisory Service, South-Western Province*

**Where it is readily available, separated milk is a valuable addition to the summer rations of pigs, calves and poultry. Mr. Rickaby draws upon experience in the South-West to suggest suitable supplementary feeds.**

SEPARATED milk is a highly digestible, protein-rich feed containing about 10 per cent dry matter, of which some 35 per cent is digestible protein. It is also an excellent source of certain members of the vitamin B complex, notably riboflavin. And any farmer who has fed separated milk to pigs and poultry will testify that, like all milk products, it has an even better feeding value than is indicated by its chemical composition.

Before making any change in livestock rations, the availability, regularity of supplies and price of the milk must, of course, be considered. As a source of digestible protein, one gallon of separated milk is equivalent to 10 oz white fishmeal, and a price of 4d. a gallon is comparable with buying white fishmeal at £60 per ton. About ½ gallon a day will completely satisfy the protein requirements of a bacon pig, and if more is fed it should be considered as a substitute for barley meal—one gallon being equivalent to about 1¼ lb meal. Thus the price quoted previously would cost barley meal on a comparative basis at about £30 per ton.

Unless freedom from tubercular infection can be guaranteed, fresh separated milk should be heated quickly to boiling point before use. However, some creameries are now pasteurizing their milk before distribution, and further heat treatment on the farm is then unnecessary. Indeed, boiling is a requirement of the Attested Herd Scheme.

Pigs and poultry may be given separated milk either fresh or sour, but as far as possible it should always be at the same degree of acidity. It is therefore usually simpler always to feed it sour. Vessels used for separated milk should be kept clean, and regular attention should be given to all containers, pipes and feeding troughs. Calves must, however, be given the milk fresh within 12-24 hours of delivery, and at blood temperature. This limits the use of separated milk for calves to those farmers who can be sure of daily supplies.

**Pigs** If supplies are limited, separated milk should be reserved for young pigs from 3 to 16 weeks old. It can be given *ad lib.* to piglets from 3 weeks up to weaning. A dry creep feed, fed in conjunction with the milk, should be offered in a separate trough, and might consist of the following mixture:

| | *cwt* |
|---|---|
| Barley meal ... ... ... ... ... ... | 5 |
| Flaked maize ... ... ... ... ... ... | 2 |
| Middlings ... ... ... ... ... ... ... | 2½ |
| White fishmeal ... ... ... ... ... ... | ½ |
| | 10 |

To each hundredweight of this mixture should be added ½ lb limestone flour, ½ lb common salt, and either 1 pint cod liver oil or ¼-½ lb dry vitamin A and D supplement.

From 8 weeks onwards, provided the pigs are receiving about ½ gallon separated milk daily per head, no additional protein need be included in the meal ration. Any one of the following mixtures is suitable:

| | *cwt* | *cwt* | *cwt* | *cwt* |
|---|---|---|---|---|
| Barley meal ... ... ... | 7½ | 8 | 6½ | 6 |
| Middlings ... ... ... | 2½ | — | 1½ | — |
| Finely ground oats or middlings ... ... ... | — | 2 | — | 2 |
| Coarsely ground wheat ... | — | — | 2 | 2 |
| | 10 | 10 | 10 | 10 |

For every hundredweight of meal mixture, 1 lb limestone flour, 1 lb sterilized feeding bone flour, and ½ lb common salt should be added. Cod liver oil or a dry vitamin supplement should also be included in the mixture, as recommended for the piglets, until the pigs are 18 weeks old.

Probably the simplest way of feeding separated milk to baconers is to allow each pig ½ gallon daily from weaning to slaughter, plus as much meal as it will readily clear up in about 20 minutes per feed twice a day, until a daily meal consumption of 4 lb is reached. Thereafter, the meal should be increased by ¼ lb each succeeding week up to a maximum of 5½ lb per day.

Alternatively, where restricted feeding is practised after weaning, the pig could be given ½ gallon separated milk a day with meal according to the following age chart:

| Age of Pig *weeks* | Daily Ration of meal per Pig *lb* | Age of Pig *weeks* | Daily Ration of meal per Pig *lb* |
|---|---|---|---|
| 9 | 2 | 21 | 5 |
| 11 | 2¼ | 23 | 5¼ |
| 13 | 3 | 25 | 5½ |
| 15 | 3½ | 27 | 5¾ |
| 17 | 4 | 29 | 5¾ |
| 19 | 4¼ | | |

If the separated milk is cheap and readily available, then the allowance could be increased to one gallon a day at about 12 weeks old. This amount can be regarded as an optimum for a bacon pig, and should be fed throughout, the meal being given as before, but restricted to a maximum daily consumption of 5 lb per pig. Some farmers give strong store pigs up to 1½ gallons separated milk a day, in which case the daily meal allowance need not exceed 4 lb per pig. Where dry self-feeders are used and the pigs are being given separated milk, the meal should be restricted after 17 weeks old to 4-5½ lb per day, according to the amount of milk fed.

Fodder beet, cooked potatoes or boiled swill can be fed to appetite with a daily allowance throughout of 1 gallon separated milk and 2½ lb meal per pig. One month before slaughter, it is advisable to restrict the pig's allowance of these bulky foods to 15 lb beet, 10 lb potatoes, or 9 lb swill; in this case the meal mixture fed should be mineralized by adding 1½ lb limestone flour, 1½ lb sterilized feeding bone flour, and 1 lb common salt to each hundredweight of the mixture.

Up to 1½-2 gallons of separated milk can be given to a breeding sow, and the allowance of meal or nuts reduced by about 1½ lb per day. The meal ration used for the sows can consist of:

| | *cwt* |
|---|---|
| Barley meal *or* other ground cereals ... ... ... | 6½ |
| Middlings ... ... ... ... ... ... ... | 2½ |
| White fishmeal ... ... ... ... ... ... | ¼ |
| | 10 |

Minerals and vitamins should be included in this mixture as recommended for piglets.

If dried grass or lucerne meal is available, 5 per cent could be included with advantage in all the suggested meal rations, and particularly for the piglets and sows, merely using ½ cwt in a 10 cwt mix to replace ½ cwt ground cereals or middlings. Also, whenever separated milk is fed to any type of pig, additional water should be offered separately.

**Calves** Separated milk can be introduced gradually into the feed of the calf during the third week of life, using the following feeding chart:

| Age *weeks* | Whole Milk *pints per day* | Separated Milk *pints per day* | Dry Concentrates *lb per day* |
|---|---|---|---|
| 1 | 6-8 (including colostrum) | — | — |
| 2 | 8-10 | — | — |
| 3 | 10 | 2 | ¼ |
| 4 | 8 | 4 | ½ |
| 5 | 4 | 8 | ¾ |
| 6 | — | 12 | 1 |
| 7 | — | 12 | 1½ |
| 8 | — | 12 | 2 |
| 9 | — | 12 | 2½ |
| 10 | — | 12 | 3 |
| 11 | — | 12 | 3 |
| 12 | — | 12 | 3 |

Cod liver oil, at the rate of ½ oz per calf per day, should be fed in the separated milk from the 4th to the 9th week. Salt licks should be provided for the calves, and the concentrate mixture made up of:

| | *cwt* |
|---|---|
| Crushed cereals ... ... ... ... ... ... | 6 |
| Bran ... ... ... ... ... ... ... | 1 |
| Linseed cake ... ... ... ... ... ... | 2 |
| White fishmeal ... ... ... ... ... ... | 1 |
| | 10 |

To every hundredweight of this concentrate feed should be added ¼-½ lb dry vitamin A and D supplement.

The concentrates should be introduced at 2-3 weeks of age and given *ad lib.* until the calves are consuming 3 lb per day per head. Where the calves are intended for beef, the daily allowance of concentrates should be quickly increased according to appetite to 5 lb daily. Best hay should be freely offered from the third week onwards, and a small allowance of green food or sliced roots may be given from the tenth week. Where supplies of separated milk are plentiful, up to two gallons can be fed daily to beef calves until they reach the age of 5 months.

**Poultry** Separated milk, fresh or sour, is an excellent protein food for poultry. It can be given as a drink in place of water, or it can be be used to make a wet mash. To prevent digestive troubles, either fresh or sour milk should be given consistently. For chicks under a week old, a start can be made with 1 quart per 100 birds, diluting it with an equal amount of water. Thereafter, the daily quantities (without dilution) per 100 birds can be increased as follows:

| | *gal* |
|---|---|
| 1-8 weeks ... ... ... ... ... ... ... | 1½ |
| 8 weeks to maturity ... ... ... ... ... | 2½ |
| Layers ... ... ... ... ... ... ... | 3½ |
| Intensively-housed layers ... ... ... ... | 4 |

If these amounts are supplied, all supplementary protein foods can be eliminated from the diet, which may then consist of cereals and some wheat offals with added minerals and vitamins, as follows:

Chick Mash (to 8 weeks old)

| | *cwt* |
|---|---|
| Dried grassmeal | ½ |
| Middlings | 1½ |
| Barley meal | 1 |
| Maize meal | 2 |
| Finely ground oats | 1½ |
| Coarsely ground wheat | 3½ |
| | 10 |

To each hundredweight of chick mash should be added 2 lb limestone flour, 1½ lb sterilized feeding bone flour, ½ lb manganized salt, and either 1 pint cod liver oil or ¼-½ lb dry vitamin A and D supplement.

Mashes for Growers (from 8 weeks) and Layers

| | *cwt* | *cwt* | *cwt** |
|---|---|---|---|
| Dried grassmeal | ½ | ½ | ½ |
| Middlings | 1½ | — | — |
| Barley meal | 3 | 3 | 2½ |
| Maize meal | — | — | 1½ |
| Finely ground oats or middlings | 1 | 2½ | 2 |
| Coarsely ground wheat | 4 | 4 | 3½ |
| | 10 | 10 | 10 |

* for layers only

To each hundredweight of mash should be added 1½ lb limestone flour, 1 lb sterilized feeding bone flour, ½ lb manganized salt, and either 1 pint cod liver oil or ¼-½ lb dry vitamin A and D supplement. The dried grass and vitamins could be omitted during the summer months from the rations of birds on good range.

All birds should have access to insoluble grit of appropriate size, and limestone grit or oyster shell should be supplied for layers.

A growth stage is reached when the recommended levels of separated milk do not satisfy the full daily liquid requirements of the birds, after which water should be provided in separate containers. Thus a laying flock of 100 birds may drink about 5-6 gallons of fluid daily to meet their full water requirements. Of this, only 3½-4 gallons need be separated milk.

For table birds in the later stages of fattening, a reliable and well-tried ration is one consisting of Sussex-ground oats and separated milk, mixed to the consistency of thick cream. However, cockerels intended for broilers may have only milk to drink until they are sold.

As with other farm stock, it is essential that all vessels containing milk and those used for feeding should be kept scrupulously clean. If there is any putrefaction, scouring will follow, with fatal results to the flock.

# N.A.A.S. EXPERIMENTAL HUSBANDRY FARMS AND HORTICULTURE STATIONS

## THE CENTRES REPORT

J. A. McMillan, O.B.E., B.Sc.,
and
C. E. Hudson, C.B.E., N.D.H., V.M.H.

IN December 1952, we introduced readers of AGRICULTURE to these N.A.A.S. farms and stations and promised to give information about their development from time to time. Good progress has been made in the purchase of additional centres since then, and much experimental work is now under way; and so it was thought that each Farm and Station Director in turn should tell the story of his centre. These articles will appear in AGRICULTURE during the next twelve months or so.

This note of introduction to the series gives the locations of the centres, explains their function and how the experimental work there is co-ordinated with that at research stations and elsewhere.

**Farms and Stations** There are now twelve farms, chosen to represent important soil types and differing systems of farming. A glance at the list below indicates how wide is the range of farming conditions.

EXPERIMENTAL HUSBANDRY FARMS

| FARM | COUNTY | SOIL TYPE | ACREAGE | ANNUAL RAINFALL (*in.*) | ALTITUDE (*ft*) |
|---|---|---|---|---|---|
| Bridget's Farm, Martyr Worthy, Winchester | Hants | Chalk | 1,035 | 30 | 300 |
| Cuckoo Pastures, Boxworth | Cambridge | Boulder Clay | 849 | 22 | 190 |
| Drayton Farm, Stratford-on-Avon | Warwicks | Lower Lias Clay | 450 | 24 | 200 |
| Gleadthorpe Farm, Welbeck Colliery Village, nr. Mansfield | Notts | Bunter Sand | 493 | 24 | 150 |
| Great House and Alden Farms, Helmshore, Rossendale | Lancs | Boulder Clay | 350 | 50 | 700-1,200 |
| High Mowthorpe Farm, Duggleby, nr. Malton | Yorks | Chalk | 1,070 | 30 | 400-650 |
| Terrington St. Clement, nr. King's Lynn | Norfolk | Silt and Brickearth | 200 | 22 | 13 |
| Kirton Farm, Kirton, Boston | Lincs | Silt and Brickearth | 104 | 22 | 14 |
| Liscombe and Old Ashway Farms, Dulverton | Somerset | Devonian Shales and Sandstone | 485 | 55 | 800-1,200 |

| Farm | County | Soil Type | Acreage | Annual Rainfall (*in.*) | Altitude (*ft*) |
|---|---|---|---|---|---|
| Pwllpeiran Farm, Cwmystwyth, Aberystwyth | Cardigan | Peat and Shale | 3,000 (approx.) | 60 | 750-2,100 |
| Rosemaund Farm, Preston Wynne, Hereford | Hereford | Old Red Sandstone | 436 | 26 | 250 |
| Trawscoed Farm, Trawscoed, Aberystwyth | Cardigan | Shales and Grits | 1,000 | 45 | 100-1,100 |

The original recommendation included a farm representative of the lighter arable land of the Eastern counties (the principal cereal-growing area). This need has been met through a close association with the experimental work at the Norfolk Agricultural Station, Sprowston, Norwich.

The Experimental Horticulture Stations, like the farms, were chosen with similar considerations in mind but, unlike the Husbandry Farms, the Horticulture Stations are sited on medium soils, which can be expected with good management to grow horticultural crops satisfactorily. The main stations are shown below.

**HORTICULTURE STATIONS**

| Station | County | Acreage | Annual Rainfall (*in.*) | Altitude (*ft*) |
|---|---|---|---|---|
| Brogdale (National Fruit Trials) | Kent | 185 | 25 | 140-200 |
| Efford | Hampshire | 376 | 28 | 20-60 |
| Ellbridge Sub-Station | Cornwall | 5 | 45 | 170-230 |
| Fairfield | Lancashire | 22 | 35 | 80 |
| Lea Valley Sub-Station, Hoddesdon (in process of development) | Hertfordshire | 26 | 24 | 135 |
| Luddington | Warwickshire | 230 | 24 | 110-190 |
| Rosewarne | Cornwall | 109 | 40 | 140-160 |
| Stockbridge | Yorkshire | 161 | 22 | 25 |

Brogdale has been chosen as the new home of the National Fruit Trials. These trials are run jointly with the Royal Horticultural Society at Wisley and are being transferred to the new site, which will then become the sole responsibility of the N.A.A.S.

In addition, three small horticulture demonstration centres have been set up in Wales. These differ from the farms and stations in that they are located in areas where the demonstration of proved practices is considered important.

**HORTICULTURE DEMONSTRATION STATIONS**

| Station | County | Acreage | Annual Rainfall (*in.*) | Altitude (*ft*) |
|---|---|---|---|---|
| Bryn Adda, Bangor | Caerns | 26 | 42 | 225-300 |
| Cleppa Park, Newport | Mon | 68 | 40 | 52-106 |
| Trawscoed, Aberystwyth | Cardigan | 3 | 50 | 100 |

The experimental husbandry farm at Kirton is also used for experiments with bulbs, and the farm at Rosemaund for experiments on hops.

**How they Work** Each centre is worked as a unit, the Director being responsible for its management. He is advised by an Advisory Committee. But the farms and stations are regarded as two parallel series, one for agriculture and one for horticulture, and the experimental work is planned on the advice of either the Experimental Husbandry or Horticulture Committee of the Agricultural Improvement Council. This arrangement ensures that major problems receive priority and that the layout of experiments can be so arranged as to secure information on the effects of such features as soil and rainfall on the responses to differing treatments. The centres also carry out experiments on local problems.

The co-ordination of experimental work with other interests is secured through the two committees mentioned above, together with their sub-committees and working parties, on which there are representatives of farmers, growers, research workers and the staffs of University departments of agriculture. Certain of the experiments are a direct follow-up of work which cannot be taken further by the research stations, nor yet be recommended with confidence to commercial producers without further trial. Others are concerned with problems for which no facilities existed until the farms and stations were set up; for example, methods of wintering hill ewe lambs and the construction and management control of glasshouses. Others arise from some new development of technique in a particular area.

The experimental work, therefore, falls mainly between work appropriate to research stations and the simpler short-term type of experiment which can be conducted on commercial holdings. The decision to purchase rather than to lease centres was based on the knowledge that they would be required to conduct long-term experiments over a wide range of agricultural and horticultural crops, on grass and on livestock, and that for the latter, and specialized horticultural crops in particular, specially designed buildings would be necessary.

The whole acreage and livestock of any centre are not likely to be involved in experiments at any one time. It is the practice to manage the non-experimental land and animals as well as possible and so provide opportunities for visitors to see well-managed crops and livestock.

There have been misunderstandings as to the purpose of these centres. It should be clearly understood that they are *experimental* centres (except for the three horticulture demonstration centres) and not demonstration farms. There is evidence that they are proving of value to the industry and the N.A.A.S. through the carrying out of these special types of experiments, and so far as that work allows they do demonstrate good farming.

The Ministry has had most valuable assistance in the choice of suitable land, in the layout of the experimental programme and the management of the centres from the Experimental Husbandry and Horticulture Committees, their sub-committees and working parties, and from the advisory committees. This is a suitable opportunity to express appreciation for their most valuable help in the early and important stages of what is planned to be a major development in scientific agriculture and horticulture in this country.

# BRIDGET'S

W. D. HAY, O.B.E., B.Sc.
*Farm Director*

THIS traditional chalkland farm is situated four and a half miles north-east of Winchester near the village of Martyr Worthy, on the gently sloping ridge of chalk which rises from the valley of the Itchen up to 400 feet altitude, with an average rainfall of 30 inches. The farm was bought by the Ministry in 1948, and possession was taken immediately after harvest that year. Just before it was taken over, it had been carrying a bail herd of Dairy Shorthorns and a hurdled flock of Suffolk sheep.

Of a total area of 1,035 acres, about 100 acres were woodland and scrub, and the greater part of the farm was without water, fences or lateral roads. The buildings were those of a typical downland farm of that time—stables, cart-shed and thatched barn, with a good farmhouse and a number of cottages, the majority of which were old-fashioned and in poor repair judged by modern standards. In comparatively recent years, a yard, stables and implement shed had been built at the lower end of the farm, and a tie-up and bucket plant for 40 cows was also in existence. With the exception of the thatched barn, the buildings have been retained and additions made, including a yard and milking parlour for 80 cows, grain drier and storage for 450 tons, machine shop, experimental stores, fertilizer accommodation, implement shed, Dutch barns, and calf rearing pens. Five of the old cottages were fit for renovation and twelve new ones have been erected. Some two miles of lateral roads have been made, the foundations of which are flints picked from the fields; contrary to popular opinion, large flints have practically disappeared from the fields, except where deep ploughing takes place. Where possible, fields have been fenced in units of approximately 20 acres and water laid on. Without detracting from the appearance of the countryside, some 80 to 90 acres of woodland and scrub have been reclaimed, but necessary shelter-belts have been left and new ones planted with chalk-loving trees—sycamore, Norway maple, beech, chestnut and Corsican pine.

These farms were instituted mainly for fundamental long-term experimentation on crops and livestock, but, obviously, if results are to appeal to the farmer, the farm itself must be capable of showing at least one high-class pattern of farming on the chalk. Within the requirements of crops, grass and livestock for the general experimental programme, the Farm Director, with the advice of his Farm Advisory Committee, is responsible for the management of the farm as a whole.

**The Arable Side** A farm such as Bridget's, with nearly 1,000 acres in hand, could, of course, be farmed in many ways, but as corn is still very important, that crop, with some forage crops for livestock, forms the backbone of the arable rotation and alternates with grass and lucerne leys. To reduce the risk of over-cropping with cereals, however, other arable cash crops have been introduced, such as potatoes, peas, sugar beet, mustard and, up to 1955, rape for seed; this system has already virtually eliminated cereal diseases, and high yields of barley and wheat are now expected. A word must be said on winter conservation of the produce of leys. This is based on silage and tripod hay, the latter method being persisted in for two reasons: (1) Although heavy in manual labour, it is still probably the safest

and one of the most economical methods of conserving that very wonderful crop, grass, by the small farmer. It is hoped to mechanize the process very soon. A watchful eye is being kept on other modern methods of haymaking, and there will be no hesitation in changing over if a better and safer method is found. (2) Some 5 million acres are made into hay every year in England and Wales—a state of affairs that does not seem to alter very much, even with the introduction of silage and dried grass—and it seems imperative to demonstrate a method of haymaking that will obtain the highest quality product from this large acreage.

High-class cultivations are not forgotten, and this, coupled with the full use of weed-killers etc., ensures full crops and no failures. A general fertilizer programme is followed, full use being made of granular fertilizers, and not forgetting the use of straights such as basic slag, potash and nitrogen where desirable. The lucerne crop is being developed, and it may be that this will to a great extent displace grass leys if better methods for its utilization can be found. An experiment on the treatment of this crop is being started at Bridget's in the spring of 1957. There is no difficulty in growing lucerne; generous annual potash applications (3-4 cwt muriate of potash per acre) and a reasonable application of soluble phosphates in the seeding year are the answers under our conditions.

**The Livestock Side** Obviously, livestock plays a large part on this farm—some 100 cows are regularly in milk, and for the most part these are fed on crops grown on the farm, together with purchased concentrates where the yield justifies it. Maintenance and four gallons are usually produced on spring grass (except 1956!), and, later on in the season, when grass deteriorates, maintenance and one or two gallons; but with the possibilities of the better utilization of lucerne, it is hoped to get maintenance and three gallons for a much longer period. In the winter, maintenance and at least two gallons should easily be attainable on bulky foods, hay, forage crops and silage, provided they are of high quality.

Some 200 Clun Forest ewes and their lambs are maintained as a pure-bred flock and are available for experiment.

A herd of pigs, Landrace and Landrace/Large White crosses, has just been started under a system of farrowing in huts in the field, with bacon production in a special type fattening house.

## EXPERIMENTAL PROGRAMME

Experimental work is being carried out on both crops and livestock. This falls into two main categories:

1. Long-term experiments which have been laid down on a national scale.
2. Short-term trials, many of which are of local interest.

The long-term experiments have been designed to answer pressing problems of a fairly fundamental nature that apply to the whole of the country, and, to obtain information under a range of soil and climatic conditions, each experiment has been laid down on five or six different experimental husbandry farms. The actual experiments on each farm are, of course, chosen with regard to the class of farming and soil type of the district. Included in the work in progress at Bridget's are experiments to determine the effect of alternate husbandry and different methods of managing leys on soil fertility, the persistency of potash and various forms of phosphate in the soil, and the effect on soil fertility of increasing the amount of top soil by deeper ploughing. In the livestock department, there are experiments on cattle and sheep; for example, the effect of various planes of rearing on the production of the mature milking animal.

**Crops:** *Long-term Experiments* The effect of various types of ley and ley management on soil fertility is obviously of great importance in an area of inherently poor soil and where the most important crops are grass and corn. Work on this subject began in 1951, but it is obvious that reliable information on changes in soil fertility cannot be obtained quickly, and it is unlikely that final results will be available for another fifteen to twenty years. Unfortunately, but possibly not surprisingly, the same applies to the other long-term experiments mentioned below. Some interim results of great interest have already appeared from this work, however. Lucerne has shown itself less efficient than the grass leys in binding the soil and improving soil structure, and has also markedly reduced the soil reserves of potash, unless heavily manured with this fertilizer. The great value of dung on this soil type has been demonstrated repeatedly, even for crops grown after a three-year ley and given generous dressings of fertilizers.

The soil at Bridget's is classified as "low to very low" in both phosphate and potash, and the experiments with these fertilizers, which are being carried out in close collaboration with the N.A.A.S. Provincial Soil Chemists, always arouse great interest among visitors. The work has not been in progress long enough to give much information on the persistency of the various fertilizers, but it has demonstrated the supreme importance of potash for both potatoes and lucerne, and the lessons learned have been used in the manuring of the farm crops. The results from the phosphate trial have also been impressive and emphasized the great importance of this fertilizer. It is clear that for a quick response, a highly soluble form of phosphate is essential on this soil, but the long-term response to high-grade basic slag has been marked and rather surprising. These experiments have also shown the importance of adequate phosphate and potash for spring corn, and this year they demonstrate very clearly the supreme importance of these two fertilizers in a dry season.

The depth of ploughing experiment has been in progress for several years, but the work will be of greatest interest in a few years' time, when uniform soils of different depths have been produced on the plots under the different treatments. A comparison of various times of applying phosphate and potash has recently been introduced into this experiment.

A trial is also in progress on the effect of the continued use of various types of weed sprays. This should give valuable information on the effect of these chemicals on the yield and nutritional quality of a range of crops, as well as their effect on weed population.

*Short-term Experiments* Up to now most of the short-term trials have been concerned with cereals, but other trials have been done, or are in progress, on the manuring of both seed rape and maincrop potatoes, and, as already mentioned, work is projected on the management of lucerne when used primarily as a grazing plant. The expression "short-term experiment" requires some explanation. The actual experiment is usually completed in one season, but the work must be repeated for at least three, and possibly five, years to give results over a range of seasonal conditions. The cereal experiments at Bridget's cover the questions of seed rate and time of application of nitrogen for autumn wheat, spring wheat and spring barley. Much of the work has been done previously in other districts, but it was thought advisable to repeat it at Bridget's to obtain results that were applicable both to the district and to modern high-yielding cereal varieties. The work with autumn wheat is of particular importance in this area, as the yields from this crop in this district are often disappointing.

As yet, these experiments have been in progress for only one or two years, but we already have results which, although requiring confirmation, are of some interest. It appears that this work will confirm the fallacy of using heavy seed rates for spring wheat when drilled under first-class seedbed conditions, and it should give valuable information on the best stage of growth at which to top dress this crop. With autumn wheat, early nitrogen appears to be of great importance; there is an intriguing suggestion that on this class of land, heavy seed rates may be necessary to give the full yield.

**Livestock Experiments:** *Cattle* Soon after the Ayrshire herd was established at Bridget's in 1950, 64 heifers were reared from birth on varying planes of nutrition to ascertain the effect on growth, fertility and eventual milk yields. Full details of the growth rates of the various groups will be published elsewhere, but it is regrettable that the incidence of disease (*Vibrio foetus*) in the field has now made it impossible to obtain much information on fertility and milk yields.

Other trials designed to discover cheaper methods of rearing calves to 12 weeks of age and subsequently through their first summer and winter have aroused considerable interest, but they require to be repeated before reliable data can be compiled.

In conjunction with the staff of the National Institute for Research in Dairying at Shinfield, various feeding trials have been carried out with varying amounts of concentrates and roughages.

*Sheep* Work with the Clun Forest sheep has been confined to investigations on the advisability of breeding from ewe lambs and on the worm infestation of sheep kept continuously on a relatively small area.

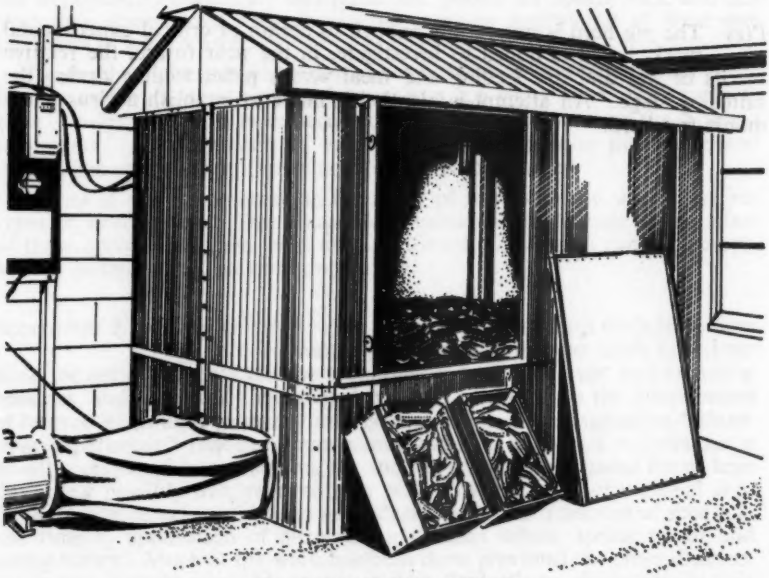
*Pigs* The pig herd is not yet big enough to permit of critical experimental work, but it is hoped to investigate, in the near future, the relative merits of wet and dry feeding and meal versus pellet feeding during the fattening stage. An attempt is also being made to establish a virus pneumonia-free herd.

# DRYING HYBRID SWEET CORN SEED

ALLAN A. JACKSON, B.Sc.
*Wye College, University of London*
and
P. FINN-KELCEY
*Electrical Research Association*

**A new type of electrical drier at Wye College is drying hybrid sweet corn and other seeds gently, economically and without damage to subsequent germination.**

LAST year was a good one for sweet corn seed production, and it was most fortunate that, for the first time, we had at our disposal at Wye a prototype electrical seed drier capable of dealing with the crop of 8,000 lb of cobs. In its present form the drier is an aluminium structure with a floor area 10 feet × 6 feet and a pitched roof 7½ feet to the ridge. The lower 12 inches of the structure is in the form of a plenum chamber, the top of which is a false floor of expanded aluminium reaching to within 12 inches of the side walls, the remainder being blanked off with solid sheets. This form of construction was adopted so that the drier could stand in the open if necessary. A drier of this kind is suitable for dealing with a wide range of threshed seeds, either bagged or loose, and it may also be used for maturing or just "brightening up" cobs; also for drying onion and leek heads, radish haulm, etc., to give better separation in the drum.



**The electrical drier at Wye**

The fan chosen to deal with this widely varying duty is of a 12-inch diameter, axial-flow type, coupled by a V-rope drive to an externally-

mounted electric motor. With this arrangement, the air inlet can be suitably baffled without damage to the fan or motor and according to the needs of drying. Coupled to the outlet of the fan is an electric air heater mounted in a cylindrical duct of the same diameter as the fan, the heating load being divided between twelve separate elements. The air, after passing the heater, flows through a flexible "fish-tail" expansion duct, enters the chamber and passed upwards through the material to exhaust at the eaves and ridge.

To ensure the utmost economy in air heating costs, and to keep the temperature of the air as low as is consistent with the rate of drying required, the heater elements are controlled by a humidistat placed in the chamber. The setting of this can be varied effectively between 30 and 90 per cent relative humidity. Thus in the early stages of drying sweet corn cobs with a moisture content of 60-70 per cent, maximum airflow and a low humidistat setting would be chosen; as drying proceeds, the airflow can be progressively reduced and the relative humidity setting gradually raised to, for example, 55 per cent. In this way, the air coming off the surface of the seed is kept near saturation and the minimum of heat is lost in the exhaust air. On the other hand, with a deep loading of brassica, radish, or flower seed still on the haulm and waiting to be threshed, a few hours' aeration at 60 per cent relative humidity and with a moderate airflow will greatly improve the separation, reduce damage to seed, and often complete the operation in one passage through the drum.

**Flexible Form of Drier** Little is known about the physical processes that take place within the seed during drying, but there is abundant evidence that great damage can be done to the germination of a sample by drying it too rapidly and at a high temperature. The experimental drier at Wye is intended to remove the surplus moisture in a "leisurely" and more natural manner at temperatures rarely exceeding those recorded on a hot summer's day. The drying and maturing of valuable seed crops in good weather is a skilled job; in wet and catchy seasons losses can be heavy. It is hoped that further investigation will show that a flexible form of drier designed on these simple lines can be used to avert the disaster of a wet season, as well as be of service in a dry year; also that the combined initial and running costs will be less than the value of a crop lost under bad harvesting conditions.

We had 1½ acres of sweet corn at Wye last year, which produced a yield of about 8,000 lb of immature, stripped cobs. During October the cobs were harvested by two men, who loaded them direct into a tractor trailer. Each trailer load was taken to a field shelter, where the cobs were stripped and packed into bushel boxes ready for removal to the drier. The cobs were loaded into the drier to a depth of 3 feet, giving a loading of between 1 and 2 tons of cobs. The temperature remained at 60°F for the first three days of the drying process. This was the period of greatest water loss, so full air was required. Drying continued for eight days, and for the latter part of this period the temperature was maintained at 80°F with reduced air speed. The drying of the whole crop was completed in 21 days, with a consumption of 5,000 units of electricity and at a cost of £31. After drying, the cobs produced 1½ tons of seed with a germination of 92 per cent.

The ripening and drying of sweet corn is not comparable with the routine drying of other seed crops. Without special ripening equipment, it is not possible to produce a good sample, because seed never matures in the field. Besides this, hybrid sweet corn seed is a particularly valuable crop and justifies the expense of the ripening and drying process described above.

**Possibilities for Other Seeds** As well as being used for sweet corn, we have tried out the drier for drying radish seed in bags and for the preparation of antirrhinum seed for threshing. Radish seed is particularly susceptible to loss of germination capacity due to high moisture content of the seed when it is stored in bags immediately after threshing. This effect was noted at Wye after the wet season of 1954. In 1955 one ton of bagged radish seed was dried in 48 hours with a 7 per cent loss of moisture. There was no subsequent loss of germinating power. The treatment of the antirrhinum seed crop demonstrates another use for the drier. Part of the 1955 crop was cut in a green condition and was given 36 hours of aeration at 60 per cent relative humidity before threshing. This treatment simplified harvesting and extraction and resulted in an unexpectedly high total yield.

Further trials will be carried out on onion, leek and cauliflower, and the drier will be modified so that it has the widest possible use. It is felt that a small drier of this sort may appeal to seed firms and other organizations who are producing valuable seeds, particularly small lots of stock seed. The value of the drier will be enhanced if it is sufficiently flexible in use to dry economically both small and large quantities of seed and to prepare the more difficult crops for threshing.

An account of the production and drying of commercial crops of hybrid sweet corn at Wye was given in Mr. Allan Jackson's earlier article (*Agriculture*, 1954, **61**, 77-9).

# MACHINE PICKING OF HOPS

CATHERINE L. JARY, B.SC., and G. P. CHATER
*National Agricultural Advisory Service*

Shortage of casual labour is forcing hop growers to mechanize their hop harvesting. The authors survey the changes in hop growing, harvesting and drying practices which are being brought about by the change-over from hand picking.

HOP picking has always been a time of great worry and stress to the growers. This was so even in the past, when casual labour was plentiful and the occasion was regarded as the normal form of "holiday with pay" for many families in London, the industrial areas of the West Midlands, and South Wales. But in recent years, as the supply of hop pickers has steadily dwindled, it has become increasingly difficult for the grower to harvest his crop economically and safely. The shortage of pickers first became serious in the West Midlands, and it was in that area, therefore, that machine picking developed and first became an established practice.

Hop-picking machines are not a new idea (there are records showing their existence a hundred years ago), but it was not until 1934 that a large stationary machine was installed for commercial use in this country. The machine, however, was too large and cumbersome to be practicable for many growers. The real expansion of machine picking began in 1949, when a new stationary type was produced. Although it followed the general principles of the earlier design, it was more compact and manageable than its predecessor, and suitable for growers with moderate acreages.

Until 1951 these machines were confined to the West Midlands, but in 1952 the first three were installed in Kent. The total number operating in

1952 was about fifty, but within two years it had been more than doubled and the practice had become well established in Kent as well as in the West Midlands. The proportion of the total English hop crop picked by machine in 1954 was nearly 15 per cent—the greater part being in the West Midlands, where about one-third of the crop was harvested mechanically. In 1955, the number of machines operating approached two hundred, and picked about 30 per cent of the total crop.

This intense demand has given impetus to the designing and manufacture of new machines, with the result that whereas up to 1954 only one type of machine was being manufactured commercially, in that year several new prototypes appeared, introducing variations in size, design and cost. One of these prototypes was a stationary machine broadly similar in its method of working and capacity to the established model, but incorporating a new type of picking mechanism. All the other prototypes exploited the idea of picking hops in the field, thus avoiding the necessity of transporting a large bulk of material, and, in some cases, making it unnecessary to cut the bine at all. The following year saw yet further developments, both in Kent and the West Midlands, and by 1957 growers will probably have quite a choice of machines, both stationary and portable, to meet their individual needs.

The ideas behind the development of these new types are broadly of two kinds: first, to reduce size and cost of the machines and so bring them within the reach of smaller growers (about 60 per cent of growers have less than 20 acres of hops); second, to introduce new principles of operation designed to reduce the breakage of the hops. The prototype machines now in existence or development suggest that both these aims may be fulfilled in the near future. In addition, there have been modifications of the existing stationary machines with a view to reducing the number of attendants necessary, and attempts to improve the mechanism for picking laterals.

**Operation of the Stationary Machine** Since only the stationary machines are at present in large-scale commercial use in this country, a detailed description of the method of operation may be confined to that type. The machine itself is housed in a Dutch barn or similar building, usually close to the oast, and the complete hop bines are cut in the gardens (yards) and brought to it. Thus, apart from the six or seven men engaged in cutting and carting the bines, the rest of the labour force (originally between twenty and twenty-five, but now in some instances as low as seven) work under cover and in conditions approximating to those of a factory.

On arrival at the machine, the bines are hooked on to a continuous track, which carries them into and through the main picking mechanism. Here, practically all the hops and leaves and some of the laterals are stripped off the bines by banks of spring-loaded loops carried on rotating drums.

The next stage is to take out the torn-off laterals and pick them separately, and this presents one of the most difficult problems to be solved in machine picking. Two kinds of lateral picker have been developed; one has to be fed by hand with individual laterals—an effective but expensive method—while the other is designed to handle the job automatically. The latter consists of groups of rubber-covered rollers rotating at different speeds, through which the laterals are carried. These are being gripped between one pair of rollers while the others take off the hops and some leaves. The principle is ingenious, but in practice the results are not uniformly good.

Whilst this is going on, the main stream of picked material has passed over a mesh or roller conveyors, which allow a certain amount of loose

"petal", seeds, and other small fragments to fall through. The remainder passes to a fan cleaner, where most of the leaf and stem and some loose "petals" are sucked out. The last mechanical cleaning process is the separation of heavier pieces of petiole (often with leaf attached) and other fragments of leaf and stem. This is effected by a series of inclined belts ("cascades" or "stem-extractors"), to which the pieces of leaf and stem adhere while the hops roll backwards. Finally, the main hop stream, to which may now be added a quantity of loose "petal" (separated by earlier processes) passes on to a final inspection belt. Here any remaining large pieces of leaf and stem are picked out by hand. At the end of the machine the hops may be bagged immediately or elevated to the oast and bagged there.

To obtain the most efficient machine performance, it is necessary to feed the bines in a continuous flow. This involves keeping a reserve at the machine so that there is no interval in feeding between the trailer loads of cut bines. But it is also important not to have too many bines waiting, particularly in hot weather, otherwise they will wilt. When this happens the hop cones open and are more likely to be damaged in the machine. A number of adjustments to the machine are possible, and the grower should make full use of them to obtain the best arrangement for the particular sample of hops which is being brought in. Much will depend on the stage of ripeness of the hops and the total bulk of material on the bines, as well as the proportion of leaf and stem to hops.

**High Wastage** In the early days the trade was apprehensive about machine-picked hops, probably with some justification, since the early users of machines had to make the mistakes and gain the experience by which all have since profited. Machines inevitably break the hops more than do hand pickers, and it is unfortunate that the commonest variety of hop—the Fuggle—is easily broken or bruised. Damage caused by the machine is greatly accentuated during the drying processes, and more care is therefore required to dry machine-picked hops. It was thus only to be expected that the earliest machine samples should have been very "shattered". In addition, they often had a high proportion of leaf and stem, which further detracted from their appearance.

Nowadays, machine-picked samples are often visually indistinguishable from, and frequently cleaner than, hops picked by hand, especially when some of the separated "petal" is discarded. This latter practice does, however, lead to a good deal of wastage. It is difficult to measure the loss, but, from a limited series of investigations, it appeared that the total exclusion of separated "petal" might result in wasting as much as 1½ cwt per acre of dried hops. Taking out these broken hops is, of course, optional, but *some* waste is unavoidable. In the investigation referred to, this *unavoidable* waste varied from 1½ to 2¾ cwt per acre of dried hops when the final hop samples delivered contained 3-3½ per cent of leaf and stem; (this is a relatively clean sample). The grower must therefore decide how many hops he can afford to waste in the interest of obtaining a cleaner and less broken final sample. Present price trends suggest that it does not pay him to incur a heavy wastage to secure this standard unless he has more hops than he needs. Even though the sample may be clean and relatively whole, machine picking also involves a certain loss of resin, due to the lupulin having been shaken or blown out during the process.

**Drying Difficulties** The difficulties of drying machine-picked hops arise from the fact that these hops have an entirely different physical make-up from a hand-picked sample. The latter consists in the



An expert in the tried, traditional method.

Photo : *John Topham*

**Machine Picking of Hops** (Article on pp. 224-8)

The " feeding " end of a machine picker. The space in the centre is for the self-fed lateral picking mechanism.

Delivery end of a picker with a side conveyor for waste.

**Basket Willows in Somerset** (Article on pp. 229-32)

Growing rods and stools

Unstripped bundles under apple trees.

Withies drying after peeling and boiling.

Photo : *H. H. Meade*

main of almost whole hops, whereas the former will rarely contain as much as 70 per cent whole hops, and sometimes as little as 20 per cent. In the machine-picked lot there will also be a high proportion of loose "petal" and partly broken hops with the cone strigs exposed.

Experimental work at Wye College has demonstrated the great difference in the rate of drying between these different constituents, and has shown that the effect of conventional drying on machine-picked hops is to over-dry the loose "petal" and exposed cone strigs, resulting in a "harsh" texture in the dried sample. It is now advocated that higher air speeds should be used for machine-picked hops, with a view to reducing the total time of drying and thus minimizing the over-drying of these fractions. In addition to this difficulty, the closer packing of machine-picked hops accentuates any tendency towards patchy drying and makes it necessary to reduce the depth of loading in relation to air speed. With conventional installations, it is not normally possible, without considerable modification, to produce air speeds of more than 40 feet per minute. Even below this level it is desirable to have some mechanism for varying the air speed. It can then be reduced during the initial sulphuring and again in the later stages of drying, when the determining influence is temperature rather than air speed, so avoiding excessive use of fuel.

The ultimate development in hop drying is clearly a system of continuous drying which would obviate the need for any handling after picking, thus reducing breakage to a minimum. The prototype of such a model was, in fact, tried out in Kent in 1955. Although the capital cost of this plant may well be less than that of a conventional oast, growers are not likely to take it up while their existing oasts are reasonably satisfactory. Such plants are therefore likely to be introduced gradually, when major reconstruction or repairs of existing oasts become necessary. Another possible improvement which is now being developed could be introduced into existing rectangular kilns by providing multiple floors consisting of tipping trays.

**Suitable Hop Varieties** It has already been pointed out that the main English hop variety—Fuggle—is unsuited to machine-picking. On many hop farms it is the only variety grown, and since the picking season extends over three to four weeks, it follows that the earliest hops picked must be unripe and the last over-ripe. In both conditions, Fuggles suffer badly when they have to be picked by machine, and attention has therefore been drawn to the need for growing a succession of hop varieties or strains, so that all can be picked at the peak of maturity.

But such a system is not easy to introduce—for several reasons. The new Wye varieties of hop are all good "machine-pickers", by virtue of their inherent toughness and more solid cones. Unfortunately, the most popular of them—Northern Brewer—clashes in season with Fuggle, while Early Promise, which was becoming popular, has recently lost favour with the brewers, and Early Choice has not so far established a place for itself. Bullion and Brewer's Gold, which are both later than Fuggle, do provide hops for the end of the season. But so far as can be seen at present, both of these are likely to have only a limited demand, and are thus not suitable for widespread planting. The easy way out for growers would be to use early-maturing strains of Fuggle, which do exist, although as yet only in small quantities. Growers of the Golding types of hop are more fortunate, in that they already have a succession of varieties.

Intensive plant breeding has also been going on for many years to find acceptable Wilt-tolerant varieties (badly needed in Kent), and it may well



**Basket Willows in Somerset** (Article on pp. 229-32)

The basket weaver.

be that such varieties can, at the same time, help to meet the need for a succession for machine picking. Wye College is also trying to produce triploid strains of existing varieties, which, being virtually seedless, would be less liable to shatter, and might incidentally provide a more acceptable article for export.

**Comparative Costs** Any real comparison of the costs of machine picking and hand picking presents great difficulties. It is quite possible to consider the annual operating costs of both systems in terms both of cost per acre and cost per cwt of dried hops, and in such a comparison machines show to advantage. There are, however, so many unknowns and intangibles that these figures are misleading when considered on their own. It must be emphasized that picking machines have not been introduced for reasons of economy or in an attempt to improve the final article, but because they provide the only means whereby growers can be sure of getting their crop picked in the necessary time regardless of the weather and other conditions.

The big stationary machines are expensive; they cost about £5,000, and the building for housing them and various ancillary installations and equipment will add another £2,000. The proper rate of depreciation of the machines cannot yet be assessed, and the redundancy factor in a time of rapid development is a further complication. Every year, new modifications to existing machines are made, and although some of these can be incorporated in the older models, this involves more expenditure to keep the machine up to date. There are also indirect costs caused by a reduction of crop yield per acre and a certain loss in valuation. The reduction of yield arises partly from the actual wastage of hops by the machine and partly from the effect on the plants of the annual cutting of bines while they are still green.

Hand picking also has its indirect costs, such as the necessity for additional fencing to safeguard buildings and crops, and insurance against the risk of fire or other damage. And, above all, there is the worry for the grower, his family and staff consequent upon the large influx of temporary pickers and their families living on the farm. This last point and the related one of the present unreliability of the casual labour supply are the real reasons for the rapid increase in machine picking.

A position now appears to have been reached when the demand for the big machines is slowing down. Further development will depend partly on whether new machines can compete directly with the existing large stationary machines, either in economy or in efficiency of operation, and partly upon their suitability for the smaller grower who, at present, is able to get enough pickers from local sources to avoid having to provide living accommodation for them on the farm.

# BASKET WILLOWS IN SOMERSET

J. E. FORSHAW

*National Agricultural Advisory Service, South-Western Province*

**The willow-growing industry in the centre of Somerset's flood plain is a fine example of the way in which, despite changing times, a relatively small area continues to specialize in a particular craft—in this case the production of raw materials for the basket weaver.**

THE observant traveller on the main line from Paddington to the South-West may well notice an unusual field pattern developing for a few miles in the centre of Somerset's low-lying plain. In summer many of the fields are of an unusual green, and in winter closely-packed brown rods may often be seen emerging through a carpet of flood water. For this is the main area in England where basket willows are grown; and something over 2,000 acres in this part of the county are devoted to their cultivation.

The early history of the industry is a little obscure, but the principal developments must have occurred about two hundred years ago after the first serious drainage work had been completed in the area. Much of the land is at about sea level or little above, and has always been subject to seasonal flooding. The centre of the willow district is around the meeting point of the rivers Parrett and Tone, although other beds are to be found for several miles along the banks and flood areas of both rivers. With the general improvement of winter drainage in the area during recent years, conditions for the cultivation and harvesting of this crop have improved, although, as with other farming pursuits, the poor state of the moor roads and droves is still a serious handicap to many growers. The industry is mainly dependent upon the demand for baskets of many types, but in the last half century two world wars have affected the position a great deal, partly through the restriction of imported rods and partly through the uses to which baskets were put. For instance, in the last war many willow rods went to produce parachute hampers.

Basket-making was at one time confined almost entirely to the willow-growing area and neighbouring towns, but, although there are still a number of fine basket craftsmen to be found in mid-Somerset, it subsequently spread much farther afield. Indeed, basket-making has become a leading occupation with disabled persons, and most of the Somerset crop is now sent to be used by the blind and other disabled workers. This development has added to the general security of the industry, because of the better organized demand for good quality rods, and, as a result, some new beds are being put down every year, particularly by the progressive growers.

**Willow Species** The willow family of plants (genus *Salix*) has many members or species, including some which are grown in gardens. The Pollard Willow (*Salix fragilis*) is still seen by the roadside in low country, being used to demarcate roads and consolidate banks, but it is rapidly becoming extinct as a result of the mechanical cleaning of dykes. Another well-known species, beloved of sportsmen, is the Cricket Bat Willow (*Salix alba*—variety *Caerulea*).

The species grown for baskets are, however, quite distinct, and are often referred to as "osiers". Several species have been used, but today it is

*Salix triandra* which is chiefly grown, the most favoured variety being Black Maul (or Mole). Up to twenty-five years ago, many beds were very mixed in varieties, and there was a tendency for only the more vigorous to survive to provide propagating material for the next new bed. Fortunately, planting material has been more carefully selected during recent years, and very few mixed stocks are now seen. A lot of work was also done at one time to find other possible species and varieties, and even some American types were introduced. But with the possible exception of a variety called Harrison (*S. viminah's* × *S. purpurea*), little progress was made. Today most growers plant true stocks of Black Maul or Champion Rod.

The essentials of a good variety are that the rods shall be of suitable length, flexible but tough, even taper, and not given to bad growing habits such as side shooting or proneness to pest or disease. To pass all these tests with distinction, a new variety must be good indeed.

**Grown on Silt Land** Land devoted to the cultivation of this crop must be of the heavy silt type and not the peats commonly found in parts of this area. The willow plant will tolerate some winter flooding, but it will not stand summer drought, and a reasonable high water table must be maintained throughout the growing period of May to August. During this time, the rod often grows six inches a week, and if growth is interrupted the habit and texture of the rod will be seriously impaired. The siting of the bed is therefore very important, especially as its normal life is up to thirty years.

It might be thought that the land which will grow the longest rod would be the best to plant: but this is not so, for there is always the very serious risk that the strongest growing rods will be too soft and quite unsuitable for the best basket work. It is most important to avoid planting a strong-growing variety on very fertile land.

New beds are normally planted in freshly ploughed meadow land by the insertion of "setts" (12-inch lengths of one-year rod) during March or April. The planting distances are normally 24-26 inches between rows and about 12 inches between setts or stools. The beds are cultivated by hand or machines as far as possible for the first two or three years to suppress weed growth, but after this the land is allowed to tumble down to natural grasses. The cost of planting varies considerably, but to establish a young bed and maintain it for the first two years will cost something over £100 per acre.

A new bed is usually in full production by the fourth or fifth year, although it is at this stage that many of the troubles begin. These often include the development of coarse perennial weeds, which are very difficult to control or suppress. Weeding through willow beds in July with dense rods up to your ears is not easy work and cannot be mechanized, so animals are usually grazed over the beds in April to reduce the amount of weed growth. But they must be removed by early May when willow growth starts, unless, as the result of a late frost, it is desirable to graze the willow stools as well.

Once the willow stools are well established, it is an advantage to encourage some sort of a turf or "spine", although, with the intense shade cast by the willows, it is difficult to get a good herbage. Some preliminary observation plots with various grasses have recently been laid down to investigate this problem.

The willow crop varies enormously with the age of bed, variety and many other factors, and, in any case, the total yield is less important than the proportion of clean rods. However, to give some idea of what might be

expected, a good bed in full production would yield up to 100 bundles per acre in a good season. Effective pest, disease and weed control makes for higher output, and it is on these points that investigations are at present directed. Attempts to increase crops with fertilizers have shown that nitrogen is the only form of nutrient likely to assist rod growth, and here there is a distinct danger of spoiling the quality.

In the past fifty years many willow beds have been interplanted with apple trees. The trees develop and as the willow stools gradually die out after twenty years, a standard apple orchard remains to occupy the land. The willow grower, therefore, is often the owner of orchards as well, although this method of producing an orchard has disadvantages. Many other willow beds have returned slowly to rough meadow, but the present method is to plough them out with a " prairie buster " and re-crop the land.

**Pests and Diseases** Like most cultivated plants, willows are subject to a number of troubles through insect pests and fungus diseases, and while some of these are common to all species of willow, *Salix triandra* and other basket willow species have their particular range of pests of economic importance. The main problem with the willow rod is to maintain steady straight growth throughout the season, and any agency which slows down, distorts or stops this growth is a major enemy. One of the principal pests, therefore, is the Button-top Midge which, by damaging the growing point, starts off an immediate response of lateral growths or " feathers ". Later in the season, aphids (two different species) and " leech " often cause havoc with the shoot tips, while during May the "Elephant " beetle can cause much damage to young rods, which later develop a series of brittle lumps.

The major fungus disease is " rust " which, when severe, causes dead, brittle areas or cankers on the rod. This is most unfortunate for blind basket workers, since the canker cannot easily be detected by touch and when the rod is half woven into the basket it is liable to snap at the point of the canker. In view of this, much work has been undertaken to control the disease, with a certain amount of success.

The problem of pest and disease control in willows has recently received a lot of attention, particularly from Messrs. L. N. Staniland and L. Ogilvie of the National Agricultural Advisory Service and Dr. H. G. H. Kearns of the Long Ashton Research Station. The life histories of the pests have been established, and suitable control materials have been selected, but the major problem, as yet unsolved, is the method of applying these materials during June and July. At present, early spraying is carried out extensively with crop spraying machines, but most of the spraying is still done with knapsacks. With Mr. Staniland's co-operation a very efficient spraying device has been arranged, but its traction through the beds by a practical means for the average grower remains to be solved.

**Skill in Harvesting** The cutting of the crop begins when the rods have ripened after leaf-fall, and, floods permitting, continues throughout the winter, until April. The actual cutting is a considerable art requiring much practice, since each rod has to be severed deftly and cleanly close to the parent stool, which after many years becomes very distorted and knobbly. A very sharp hook is used, and the rod is sliced rather than chopped. Immediately after cutting, the rods are collected into bundles in similar manner to sheaves of corn. Bundles are always tied at all stages with willow bands, and the quick twisting of one of these bands is an education to the uninitiated.

The crop is brought to the stripping yard by tractor cart or, in winter, by boat and cart. Sorting of the rods into lengths is carried out as time permits by an ingenious manual process, and the rods are then rebundled to await stripping.

**Three Types of Rods** According to the method of stripping, rods can be placed in three categories—whites, buffs and browns. In spring, when the sap is rising, the rods will strip easily and naturally. The resultant rod is white and, after drying, will remain white. Special ponds holding four inches of water keep the rods fresh for the sap flow.

At all other times of the year the bark must be removed by artificial means, and heat treatment is given in boiling tanks to soften the bark. This process stains the wood of the rod a light brown and the result, when dried, is a "buff". Poor quality rods to be used for rougher work are often not stripped, and are known as "browns". There is a steady demand for buffs and whites in most lengths and, in fact, it is often difficult to get sufficient whites.

Although most of the stripping during the important spring period is now done mechanically, some growers and merchants still take out consignments to be stripped by piece work on a hand "brake".

After drying in the open for several days, there is a final examination for faults and bundling. The preparation of the finished bundle is a very skilled operation, and the result is most satisfying to anyone who appreciates craftsmanship. The size of the finished bundle is unusual, being 37 inches in circumference at not less than 2 inches from the base. No other measurement, number or weight is taken into account, whether the rods are four or ten feet long.

**Future of Willow Growing** It is usually very unwise to attempt to prophesy the future of local industries. However, changes must come, and there are two important aspects to the future of willow growing. The first is undoubtedly the outlet for the crop, which will depend largely on the demand for basketry. At present, a basket is a very serviceable container for many purposes, and as long as the price is kept reasonable it will probably retain its position. Also, the value of the industry to a large number of disabled people will, I hope, prove a stabilizing influence both for the disabled person and the willow-growing industry.

The second major problem is not unusual these days. It concerns the number of able-bodied men who are likely to stay in the willow *growing* side of the industry. The general drift from the land is noticeable in all districts, and it is feared that the really skilled man in a willow bed will become much scarcer as the years go by. Much of the production is now in the hands of the large growers and merchants, with some small growers who sometimes work part of their time with the merchant or a neighbouring farmer. It is, however, the small grower who will probably be the salvation in bad times. He would, I imagine, be the last to give up, since his willow bed is some claim to independence. The larger grower has given a lot of thought to the mechanization of the job, without much success as yet. Stripping and some crop spraying have been mechanized, but many of the harder jobs remain to be done by hand.

However, despite the difficulties, there are still in this corner of Somerset a good many men of courage and tenacity who will go on tending their willow beds, and, by producing good quality rods, find sufficient return to have made their labour worth while.

# PROGRESS WITH LUCERNE SEED PRODUCTION

A. ZALESKI, M.A.

*National Institute of Agricultural Botany, Cambridge*

**Results of intensive investigations at the N.I.A.B. indicate that most of the factors affecting lucerne seed production can be controlled by the grower to such an extent that a satisfactory yield and germination of seed can be secured.**

TWO main arguments are usually advanced to suggest that lucerne seed production is not an economical proposition in this country: one is unsuitable climate, and the other that lucerne is a very difficult crop. In spite of these, lucerne seed is normally a by-product of a lucerne ley, and where is the logic of treating the seed production of lucerne with less consideration than that of perennial ryegrass, cocksfoot or timothy?

Neither is it quite fair to blame the English climate for the crop's failure, for although our weather is unreliable, it is much better than in many other countries, where cloudbursts, hail storms during summer and hard frost in May are not uncommon. The plain fact is that because of unsuitable management and techniques, as the lucerne seed survey showed [1], growers came to the wrong conclusions. The best weather for seed production in east and south-east England should be during June-July-August, for although it is sometimes warm and reasonably dry in the autumn, the relative humidity is high and the drying power of the sun is so low that the crop is always wet. In the past, most growers cut their lucerne at the end of May and beginning of June and used the aftermath for seed, so naturally the harvest came at the end of October and during November, when the crop seldom had a chance to dry and the seed shed and sprouted to such an extent that the yield and germination were often drastically reduced.

**Choice of Strain** It is a well-known fact that some strains of herbage species are high fodder producers but low seed yielders, while other strains of the same species may produce seed readily but give a low fodder yield. From the seed grower's point of view, the strain which combines these two merits is the ideal one. Dealing with lucerne strains, the writer showed [2, 3] that some of them flower earlier than others and have the longest productive season under this country's conditions. Moreover, they are also the best fodder and protein yielders [4, 5], and naturally the demand for their seed is great.

Lucerne is a cross-pollinated plant, but in order to bring about the cross-pollination and eventual formation of seed, flowers must be tripped. (The reproductive organs in a flower are covered by petals, and the release of these organs by mechanical means, usually an insect, is called tripping.) Normally, when the flowers are tripped by insects they are cross-pollinated at the same time. Apparently, unless the flowers are tripped no substantial setting of the seed can take place. Various problems concerning tripping, cross-pollination, fertilization and the influence of weather and insects on these aspects were investigated by the writer [6, 7]. It was found that Eynsford (English early strain), Du Puits, Chartrainvilliers and W.268 (early strains) had a higher percentage of tripped flowers and produced a much greater number of pods and seeds than Provence and N.Z. strain B (mid-season strains) or Grimm and Rhizoma (late strains). The weather which influences seed setting also influences the activity of beneficial insects. The population of wild bees, which are the most effective cross-pollinators, is

very low, owing to the intensive cultivation and spraying of crops. Honeybees are useful contributors to pollination and should be used to increase cross-pollination during the flowering period wherever possible.

Although the climate cannot be controlled, the time of flowering and harvesting can. By using early strains and leaving the first growth of lucerne for seed, the crop will come to flower in June, when insects are most active. Harvest will come at the end of August to mid-September, depending on the season. To prevent the contamination of strains, if possible only one strain of lucerne should be grown on the same farm; failing this, at least a suitable isolation strip of 200 yards should be maintained.

The seed yield of any crop is usually affected by a number of complex factors. Apart from strains, climate and insects, the density of plant population, drainage, type and fertility of soil, row width, pre-cutting in spring, maturity of seed at harvest, and time and method of harvesting and threshing, affect the yield and germination of lucerne seed. Results of investigations ([6-8]) carried out at the N.I.A.B. showed that most of these factors can be so controlled by the grower that a satisfactory yield and germination can be secured under reasonable conditions. But the grower must remember that it is much safer and wiser to concentrate on *either* fodder or seed production, and not to attempt both.

**Sowing and Early Management** Close-drilled lucerne, with even a high seed rate, may be satisfactory for fodder production, but it usually fails to produce seed. For seed, the crop should be drilled in wide rows at a low seed rate and without companion grass. Well-drained clean land with plenty of lime but of medium fertility is ideal for seed production. According to White ([9]), badly drained heavy soil of high fertility depresses flower formation and in the summer induces excessive vegetative growth which is liable to lodging and attack by pests and diseases.

Seed should always be inoculated when the crop is to be sown for the first time. It is advisable to do this on the farm, but it is essential to keep seed in the dark after inoculation, and sowing should not be delayed. Lucerne can be drilled alone or under a nurse crop, provided the corn seed rate and quantity of nitrogenous fertilizers are reduced. Lucerne should never be sown in dirty or badly-drained land. It is much better to carry out the necessary cleaning cultivations (a short fallow) and delay sowing until even as late as the end of July, than to have a failure owing to weed infestation. Rolling before and after sowing should be carried out, especially on light land and with late sowings.

If lucerne is sown under corn, spring wheat, such as Atle, or stiff short-strawed barley are suitable nurse crops. Sowing lucerne under a nurse crop, apart from being economical, helps to keep the annual weeds down, but the harvest of the nurse crop should not be delayed, in order to give the lucerne an opportunity to produce some growth during September and to build up food reserves in the roots. The lucerne should be drilled on the same day, or as soon as possible after, the corn is sown. Immediately the lucerne germinates, precautions must be taken against possible weevil damage to the young seedlings. Weevil damage is most likely in districts where beans and peas are grown, and the crop should be dusted with 5 per cent DDT.

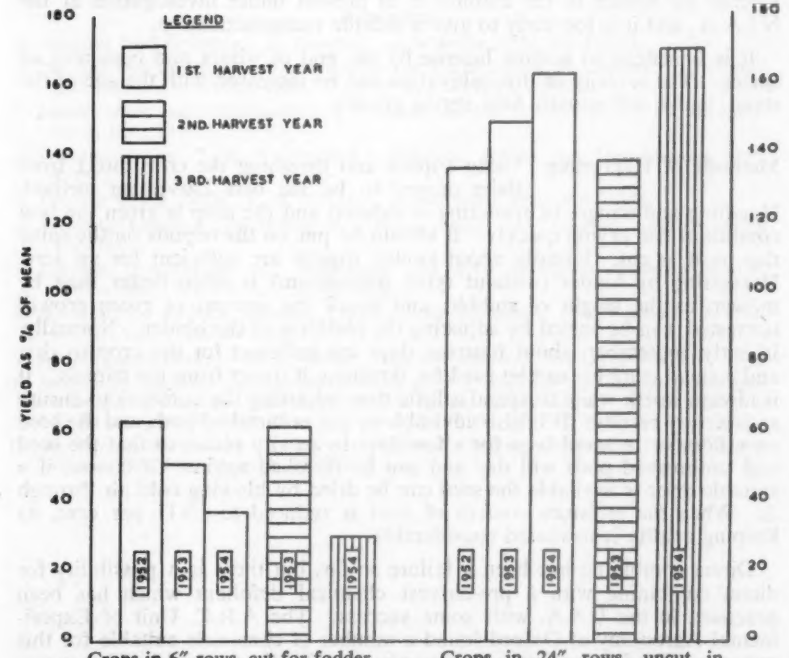
On heavy fertile land the seed can be drilled in rows about 24 inches apart at 3-4 lb per acre; on light soil it can be drilled in slightly narrower rows at 5-6 lb per acre. The row width may vary from 14 to 20 inches on light land, and from 20 to 30 inches on heavier land, according to the implements available. The crop in wide drilled rows with a low plant population per square unit has the best conditions for growth, flower and

seed development, and consequently gives the best yield of seed (⁸). If the crop is sown direct in the early spring it should be cut after it starts flowering, usually before September; otherwise it should be left undisturbed.

Before sowing it is important to find out the soil requirements, and not only the top soil but also the subsoil should be taken into consideration. As a rule, lime, where necessary, should be applied at least a year before sowing. If fertility is high no fertilizers need be given until after the first seed is harvested. Then early spring applications of about 2 cwt muriate of potash and 1-2 cwt superphosphate may be advisable. On light, poorer soil, early spring applications to the seedbed of about 3-4 cwt muriate of potash and 2-4 cwt superphosphate are beneficial. A further application of about half this quantity should be given each spring.

At least one inter-row cultivation early in the spring should be carried out. After that, provided the land was clean to start with, the early type of lucerne will usually look after itself as far as weed infestation is concerned. On no account should a cut for fodder be taken in the spring of the harvest year. The results reported by the writer (⁸) showed that pre-cutting in spring had no checking effect on the second growth but it delayed the time of flowering, ripening of seed and harvesting of the crop from three to five weeks, as compared with an uncut crop. In consequence, the crops which were cut in May were harvested in October when the airing of the crop was delayed, causing sprouting of the seed. The colour of the seed and its germination were also affected.

The effect of row width and pre-cutting in spring on the yield of crops is illustrated below.




Crops in 6″ rows, cut for fodder in May and harvested between Sept. 20 and Oct. 20.

Crops in 24″ rows, uncut in Spring and harvested between Aug. 28 and Sept. 23.

In 1952 the season was good, in 1953 bad, and in 1954 it was extremely bad, with a very wet summer and autumn. It is interesting to note that the relative differences in yield were the highest in an extremely bad season, thus indicating that wide rows, low seed rates and the sacrifice of the spring cut is the only suitable method for seed production. The average yield for three years of these five trials from a crop in 24-inch rows uncut in spring at the low seed rate, was 430 lb per acre. The germination of the seed was good. The comparable yield from a crop in 6-inch rows and cut for fodder in May, was 176 lb per acre with rather low germination.

These investigations ([8]) also showed that continuously taking the cut for fodder in spring and seed from subsequent growth affects the weed infestation and persistency of the stand considerably. Lucerne uncut in spring and harvested early for seed, managed to keep weeds down in spring and autumn (the critical times of weed infestation), owing to the rapid growth each spring and quick recovery in early autumn. On the other hand, a crop cut each spring for fodder and seeded late in the season, was late in producing growth each spring and autumn and was therefore infested by weeds.

After the crop is harvested, by the end of August or in early September, the early strains usually make a good recovery in about eight weeks, and the stand can be grazed during November-December when the lucerne is dormant. A number of investigators ([10, 11]) have shown that grazing in late autumn and winter, and a lack of winter cover, is in no way harmful to the productivity or persistency of lucerne. It may even be possible, when the seed crop is harvested early, to take a cut of fodder during October. This alternative management of taking seed from the first growth and cutting lucerne for fodder in the autumn is at present under investigation at the N.I.A.B., and it is too early to give a definite recommendation.

It is beneficial to harrow lucerne by the end of winter and beginning of spring. The severity of this cultivation can be increased with the age of the stand, and it will usually help spring growth.

**Methods of Harvesting** Using tripods and threshing the crop direct from them proved to be the best harvesting method. Handling and danger of sprouting is reduced and the crop is given the best conditions for drying quickly. It should be put on the tripods on the same day as it is cut. Usually about twelve tripods are sufficient for an acre. Harvesting by binder (without tying mechanism) is often better than by mower, as the height of stubble, and hence the amount of green growth harvested, can be varied by adjusting the platform of the binder. Normally, in early September, about fourteen days are sufficient for the crop to dry, and a small combine can be used for threshing it direct from the tripods. It is always worth while to spend a little time adjusting the combine to ensure satisfactory results. It is also advisable to put unthreshed pods and the seed on a floor or in small bags for a few days in an airy place, so that the seed and unthreshed pods will dry and can be threshed again. Of course, if a suitable drier is available the seed can be dried by blowing cold air through it. When the moisture content of seed is reduced to 10-11 per cent, its keeping quality is increased considerably.

Direct combining has been a failure so far, but there is a possibility for direct combining with a pre-harvest chemical defoliant which has been practised in the U.S.A. with some success. The A.R.C. Unit of Experimental Agronomy at Oxford found a number of chemicals suitable for this purpose. The few farmers who have already tried the method in this country have had encouraging results, but we are still investigating it.

**Seed Maturity Stage at Harvest** The stage of seed maturity at which a crop should be harvested is very important. An experiment ([8]) conducted for three years showed clearly that the best stage for harvesting, from the yield and germination point of view, is when between 70 and 80 per cent of brown pods have formed. When lucerne was harvested early, with the majority of the pods still green, there was no substantial decrease in germination: the unripe seeds, being light, were removed during cleaning, and that affected the yield considerably, but germination did not suffer. In contrast, when harvest took place in October, with nearly all pods brown but during unfavourable weather, the loss in yield and germination was considerable. Considering both yield and germination, it would be better in a bad season to cut the crop with 60-70 per cent of brown pods in September, when there is a reasonable chance of getting seed, rather than with 80 per cent in October, when the risk of losing seed is much greater. Unfortunately there is a general tendency among growers to wait until all pods are ripe. It should be realized that as the period of flowering in lucerne lasts about two months, the first flowers produce seeds early, but, by the time the last seeds are ripe, all the first seeds are likely to be lost.

In conclusion, therefore, the answer to the problem of lucerne seed production in this country seems to be the use of early strains grown in wide rows at low seed rates on well-drained land of a moderate fertility; discontinuance of the practice of taking a fodder cut in spring; using hives of honey-bees at the time of flowering; and harvesting lucerne seed at the right stage, certainly not later than mid-September.

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# FERNHURST INTERNATIONAL CONFERENCE

**The Second International Conference on crop protection organized by Plant Protection Ltd. at Fernhurst, Surrey, on June 19-21, was attended by over two hundred scientists from forty-two countries.**

BECAUSE plant pests and diseases are no respecters of national boundaries, in the long run the only effective way in which they can be prevented or controlled is by international co-operation. Such action presupposes the interchange of scientific experience, information and ideas, and the Conference organized by Plant Protection at Fernhurst Research Station on June 19-21 is therefore of outstanding significance.

**International Co-operation** DR. J. G. KNOLL, Chief of the Plant Production Branch of the Food and Agricultural Organization, reviewed in his paper the world aspects of crop protection, pointing out that the early efforts in international co-operation may perhaps be said to date from 1881, when the Phylloxera Convention was signed. (It will be recalled that the grape aphid, *Phylloxera vastatrix*, caused enormous damage in the vine-growing countries of Europe, particularly France, after its introduction with imported vines from N. America in the 1860s.) Since the Second World War, crop protection has been given much closer attention: first, because it is clearly an essential feature in agricultural rehabilitation programmes; second, because of the better facilities which now exist; and third, the increasing awareness of how quickly and widely pests and diseases can be spread by modern methods of transport. The Food and Agricultural Organization includes crop protection as a major point in its programme, and has encouraged member governments to form regional crop protection organizations. Its activities are well known in relation to the control of desert locusts, Colorado beetle, and the Mediterranean Fruit fly, to mention only a few. At other administrative levels, too (for example, the Commonwealth Agricultural Bureaux and the International Institute of Agricultural Sciences), this fundamentally necessary international co-operation is being pushed along.

**Parasite and Plant** How urgent is the need for better knowledge of the biology of plant pests and diseases is shown by the disastrous outbreaks which have occurred in countries previously free of them. In a new environment, a relatively insignificant disease organism can inflict severe losses. Maize Rust is a case in point: whereas in its native area, North America, the fungus caused comparatively little trouble, when it was found in Sierra Leone in 1949 it was particularly virulent. From Sierra Leone it spread rapidly across Central Africa and in a few years reached Kenya, Rhodesia and several islands in the Indian Ocean. In West Africa its effect on maize has been so devastating that the Government has had to import maize to make good the losses inflicted. It is likely, said Dr. Knoll, that this disease will eventually cover the whole of Africa and become a threat to the Asiatic mainland. Other, similar examples of increased virulence following change of environment have been observed with tristeza of citrus fruits in South America, Blister Blight of tea in south-east Asia, Mediterranean Fruit fly on coffee in Central America, and the Khapra beetle in stored grain in Rhodesia and the United States. Dr. Knoll concluded: "The control of pests and diseases cannot be regarded as the responsibility only of government officials, scientists and interested commercial enterprises, and even the co-operation from growers is not sufficient in many cases. The ultimate objectives of plant protection will not be

achieved until everyone who consumes plants and plant products understands the problems involved and accepts his or her share of responsibility."

In the prevention of damage by diseases and pests, the work of the plant breeder has a fundamental importance, and this aspect of crop protection formed the basis of contributions by DR. W. D. HANNA (Canada), PROFESSOR K. T. SUCHORUKOV (U.S.S.R.) and DR. R. L. KNIGHT (East Malling). Since the pioneering work by Biffin at Cambridge, fifty years ago, considerable genetical progress has been made in the production of wheat varieties resistant to rust. Resistance has also been bred into many other crops, and sooner or later the practical question has to be considered whether it is economically worth while to carry out expensive and time-consuming work to produce new varieties or to use chemical control. New varieties resistant to, say, one specific race of a disease organism, may be very susceptible to other races of the same fungi; for example, the Wheat Stem Rust, which often attains epidemic proportions in North America, has multiplied itself by "adaptation" in various countries to no less than 275 different races! It may take from seven to ten years for a new virulent race to increase from a mere trace to epidemic proportions: the breeding of a new resistant variety of wheat takes about ten years.

DR. KNIGHT took as his illustration a serious bacterial disease of cotton, called Blackarm, with which he has had considerable experience in the Sudan. Cotton varieties resistant, even immune, to this disease have been bred and give a 50-150 per cent higher yield than comparable susceptible varieties. W. C. MOORE (Harpenden) instanced the new strains of Wart disease of potatoes which are reported from Germany and other parts of Europe. These are causing heavy loss—over 90 per cent of potato varieties being susceptible.

PROFESSOR SUCHORUKOV looked at the problem as a physiologist. He said that whilst resistance is a function of genetic factors, it also varies with environment and age. The parasite reacts delicately to changes in the physiological processes of the host plant—changes which the parasite itself may have induced.

**Method of Kill** DR. J. W. L. BEAMENT (Cambridge) and DR. J. T. MARTIN (Bristol) presented interesting papers describing *how* chemicals act in their control of insect pests and plant diseases—"the mechanism of toxicity", as it was called. Dr. Martin stressed that the effectiveness of spraying depends on the physical properties of the plant as well as on the formulation of the chemical used. He felt that with our present lack of knowledge we may be using some crop protection chemicals at needlessly high rates. At Long Ashton, trials are being made to find out the necessary minimum coverage. The hazards associated with the use of toxic chemicals, both to man and to animals, would be reduced by lower rates of application.

The present concentration on selectivity in the action of toxic chemicals against fungus diseases of plants requires an intimate knowledge of the relation between chemical constitution and the plant's response—an aspect DR. S. E. A. MCCALLAN (U.S.A.) dwelt upon. His own experiments have shown that effective chemical action of fungicides is determined by two factors: the degree of chemical toxicity and the ability of the fungicide to be absorbed by the disease spores. He said that present fungicides are neither very effective nor very specific in their action—a conclusion supported by the fact that, unlike insects and bacteria, there is no evidence of a sustained resistance being developed by disease spores to fungicides.

Of course, as DR. P. W. BRIAN (Welwyn, Herts) pointed out, systemic

treatment of fungal and bacterial diseases is still in its infancy. The ideal product would need to persist long enough in the plant tissues to fulfil its toxic function, but not so long that it might leave a residual poison likely to endanger human or animal health. Some antibiotics, notably streptomycin and griseofulvin, applied to the roots, offer possibilities, but for one reason or another their use is limited. The sulphonamides have given good control of rust diseases, but, here again, the problem is to find an effective dose which does not damage the plant.

With the greater use of toxic chemicals for crop protection, whether in the form of spray, dusts, or taken up from the soil, two hazards are inevitably increased—the risk to the operator in the field, and the risk of residual poisons in human and animal foods. In particular, this refers to organophosphorus compounds, mercurial fungicides and chlorinated hydrocarbons. Both types of hazard are being closely watched by the Government, and on consumer risk, in particular, a strong plea was made for a fluid exchange from all quarters of experience and useful information on this subject. The contribution by PROFESSORS R. FABRE and R. TRUHAT, illustrating their experience in France, was of the utmost interest.

**Mechanics of Spraying** The mechanical aspects of spraying, discussed by DR. R. P. FRASER (London) and DR. E. W. VAN DEN MUIJZENBERG, are clearly important if efficient coverage of the crop—and that means economic use of chemical too—is to be secured. Spraying problems are complex, owing to the many variables involved—the atomizer, liquid properties, and atmospheric and field conditions. The introduction of spraying machines which use air, not only as the atomizing medium but also as a diluting and conveying medium, has made necessary a reappraisal of the functions of the atomizer. Research into the size of spray droplets, their distribution under low, medium and high pressures, and projection over long or short distances, is related to atomizer design. Basically, atomizers are of three types using: pressure energy, centrifugal energy, and gaseous energy. Many modern atomizers combine two or all three sources of energy. Dr. Fraser said that in atomization practice, the theorist has been outstripped by the engineer, who, lacking fundamental data, has had to rely rather upon trial and error experiments to achieve a suitable design for a particular requirement. The small size of the atomizer and its apparent simplicity have deceived many people into believing that the problem is simple. Research over the past twenty years has shown this to be quite untrue, and our present knowledge is still extremely limited.

**Much in Little** It is unfortunate that restrictions on space preclude a more detailed reference to the wealth of information contributed by the speakers at this Conference, both from the rostrum and the floor. The experience, trials and patient investigations of years of work in the many spheres of agricultural science were compressed into these three days, and there can be no question of the supreme value which the meeting afforded. Not least was this evident in private conversations and discussions which went on outside the sessions. Plant Protection had furnished the opportunity; over two hundred delegates from forty-two countries saw to it that no barriers of language would prevent their making the best possible use of it. Clearly they had inclined to the injunction of Horace: "*Rapiamus, amici, occasionem de die*—Let us, friends, seize our opportunity from the day as it passes."

The Proceedings of the Conference will be available in the Autumn from Messrs. Butterworth.

S. R. O'HANLON

# A RECORD ROYAL

THAT annual miracle of organization—the Royal—this year spread its colourful canvas wings over 156 acres of Town Moor, Newcastle upon Tyne, from July 3 to 6. For the novocastrians it was a great occasion, being the first visit of this rural cavalcade to the city since 1935, and it was soon obvious that they and the northern farmers were going to make it a resounding success. The official first day attendance of 14,933 (the highest since 1949) was a fine start towards the optimistic target of a quarter of a million at which the R.A.S.E. had set its sights. In the event, 242,548 people paid for admission—an all-time record. Truly Newcastle lived up to its reputation as a profitable site!

Yet profit (at least, financial profit) is a secondary consideration at the Royal. The livestock exhibitor seeks honour rather than prize money (£20,000 this year); the stockman's pride in a job well done compensates him for the long hours and discomforts. Nowhere is this feeling stronger than in the stock lines, where owners and attendants gather to criticize, compare, worry, and to meet with exhibitors (and animals) from all parts of Britain. Here, for example, were three Devons from far-off Launceston in Cornwall; there a shaggy Highland bull from northern Scotland, looking strangely out of place in his man-made surroundings; and, across the way, nervous as any debutantes, the Northern Dairy Shorthorns, making their first appearance at a Royal. In all, nineteen breeds took the ring, proving beyond doubt that Britain is still the world's pedigree stock farm.

The second day opened ominously under lowering skies and heavy rain, but the show was honoured by the presence of the Queen Mother and fortunately the weather cleared in time for the judging of the champion cattle for the Burke trophies. These were awarded to the Shorthorn pair in the beef class, with the Aberdeen-Angus as reserve, and to the Ayrshires in the milk class, with the British Friesians second. The achievement of Lt.-Col Forbes, whose Ayrshire cow "Lonach Countess"—his only entry—won the breed championship for the second year in succession, deserves special mention.

With the judging over, many farmers felt themselves at liberty to explore further afield, and, after due inspection of the 50 acres of gleaming machinery, a good many found their way to the educational section. The Ministry of Agriculture's exhibit, with its theme of "Meat from the Hills", presenting in an easy-to-follow style the problems and achievements of the northern area, attracted considerable interest. Local farming was also well represented by the ambitious stand of the Northumberland, Durham and Cumberland Education Committees, depicting the range of rural education which they provide. On the outskirts, though not strictly part of the educational group, was the much-visited and televised "Electricity Farm", prepared by the British Electrical Development Association.

Overseas visitors were as numerous as ever—among them a Russian delegation, headed by the U.S.S.R. Minister of Agriculture, Mr. V. V. Matskevich, a group from China, and parties from Germany and New Zealand. Perhaps the most decorative were two chiefs from Sierra Leone. There was much for all to see, and it is hoped that none missed one of the innovations of the show—a dry-walling competition.

And so, on the Friday evening, after another Royal had shown yet again what it means to "practise with science", the workmen arrived to begin their mammoth task of dismantling. A record show—a fine show—and a happy return to the north-east.

L. W. TOLLADAY

# FARMING AFFAIRS

**Australian Fellowship in Natural History** A Fellowship in Natural History worth £1,000 (Australian) is offered by the British Memorial Fund, established in Victoria, Australia by public subscription. The Fellowship is a gesture of "loyalty, gratitude and affection" to the British people in recognition of their "role in saving civilization in the Second World War". It provides for ten months' study in Victoria for the selected candidate and covers travelling and living expenses during the period. The upper age limit for both men and women is 35, and applicants must be of British stock and have lived for at least ten years in the United Kingdom.

The Fellowship is to be granted to one of the following:

1. A graduate in science, agriculture, or forestry, who is working in the field of plant or animal ecology or taxonomy.
2. Any person whose publications or testimonials indicate that he or she has made worthwhile contributions in natural history or field biology.
3. An officer of a herbarium, natural history museum, or the British Nature Conservancy, including qualified technicians trained in the newer techniques of plant and animal preservation and display.
4. An educationalist with special qualifications in natural history or field biology.

Full details can be obtained from Colonel the Hon. W. W. Leggatt, Agent-General for Victoria and Chairman of the British Memorial Fund, London Selection Committee, Victoria House, Melbourne Place, Strand, London, W.C.2. Closing date for the receipt of applications is September 15, 1956.

A Fellowship in Chemical Engineering, and two others where applicants may choose their course of study or research, are also being offered by the Fund.

**Farm and Forest:**
**17. Starting a small Forest Tree Nursery** It really does not matter whether you raise stock from seed or buy seedlings to start off the new nursery. The only difference is that raising stock from seed calls for rather more skill and experience. A much more important consideration is the selection of a suitable, workable soil. It should be light, well drained, rather acid, and relatively free from stones and perennial weeds. Land capable of producing satisfactory cereal crops and in which the clay content does not exceed 12 per cent is suitable provided there is a depth of top soil of eight inches. Initial cultivations are the same as for farm crops. The site should be relatively level, and not too exposed; frost hollows and elevations over 800 feet should be avoided. The area should be enclosed with a rabbit-proof fence.

The object of such a home nursery is, of course, to produce suitable planting stock in the shortest time without forcing. For most species the seedlings can be transplanted at the end of the first year and placed in the transplant lines for a further year. Sometimes, however, it may be necessary for seedlings to remain in the beds for two years before transplanting. It is advisable to enclose enough ground so that a third of the nursery can be fallowed every year. This will permit rotational cropping and ensure that both weeds and nursery pests are kept in check by summer cultivation. A suitable cropping plan is: first year—seedbeds; second year—transplants; third year—fallow. On new sites, however, transplants should form the first crop, as seedling growth might be irregular.

On sandy loams of the agricultural type, fertility can be maintained for a number of years solely by fertilizers. Potanic superphosphate (16P 16K) is applied before sowing and transplanting at 14 lb per 100 sq. yards. This is followed by top dressings of nitrogen during the growing season in the form of "Nitro-Chalk" on very acid soil (pH 4.5-5.5), and ammonium sulphate on less acid soil (pH over 5.5). Both applications are made at the rate of 1 oz per sq. yard (6 lb per 100 sq. yards) at the end of June and again at the end of July. Nitrogenous fertilizers should not be given late in the season, because they encourage late growth. Fallow ground is probably best kept bare and cultivated whenever weeds appear.

The nursery seedbeds should be 3½ feet wide with 18-inch alleys between, the beds being raised a few inches by throwing on soil from the alleys. Fertilizers are worked into the top three inches. The soil should be worked to a fine tilth and firmed as for an onion bed. This treatment is necessary for all conifers and broadleaved species, with the exception of oak and chestnut. Sufficient seed should be sown to give uniformly stocked seedbeds, avoiding both over- and under-stocking. The sowing rate is therefore best determined by a laboratory germination test, but in the absence of this, an estimate of viability can be obtained by cutting a few seeds in halves and calculating the percentage of sound seed.

More information on sowing densities for individual species is given in Forestry Commission Bulletin No. 14.*

W. G. Gray,
*Head Forester, Forestry Commission*

**Experimental Husbandry** It is nearly ten years since the Ministry decided to buy a number of farms to be used as centres for long-term experimental work on crops and grass and on livestock production.

Twelve of these farms are now operating. Their work has been concentrated on the study of complex husbandry problems, the solution of which inevitably depends as much on the patient recording of careful observation as on factual results. It is not surprising, therefore, that detailed information about what has been achieved so far should be given for the first time in 1956. *Experimental Husbandry*,† published in June, discusses the results of a wide variety of experiments conducted in England and Wales. Some relate to experiments carried out during the past ten years, others to very recent trials, a number of which were made on commercial farms.

An extensive series of field experiments on the manuring of light fen soils, nitrogen manuring for wheat, and manuring for potatoes is summarized in three articles. Another article, describing results of the barley manuring experiment at the Norfolk Agricultural Station, demonstrates the importance of testing new varieties at different levels of manuring. Other papers describe experiments with drying peas and on the late application of fertilizer to potatoes.

The interest already shown in the comparison of different breeds and crosses for beef production being made at Rosemaund and High Mowthorpe Husbandry Farms should be enhanced by a paper giving details of results for the 1951 and 1952 groups. A final assessment, however, must wait for more data about more animals, some of which are still being reared.

*Experimental Husbandry*, further issues of which will be published from time to time, shows that there are still serious gaps in information about the best farming methods for local conditions, and that new problems in one

* Obtainable from H.M. Stationery Office, price 3*s*. (3*s*. 2*d*. by post).
† Obtainable from H.M. Stationery Office, price 3*s*. (3*s*. 3*d*. by post).

field of agriculture are born of changes in another, and can only be solved by detailed experiment.

**Forestry for Schools** One South Wales school—the Cymmer Afan Secondary Modern School, situated in the heart of the Afan Valley in Glamorgan—has hit upon a novel method of instilling in its pupils a love of trees and, at the same time, of making them more familiar with the rural scene. After consulting the local Conservator of Forests, the school has adopted several acres of land in the great Coed Morgannwg forest. There the pupils have erected a shelter hut and are now engaged on site clearance and tree planting.

An early task was the preparation of large-scale maps of the plot, and on these the children are beginning to record a good deal of information. A census of bird life has been taken—a prerequisite to the erection of nesting boxes in the trees—and plant surveys are being made. The other activities include investigations into animal and insect life, map reading and surveying, the examination of soils, woodwork, art (with opportunities presented for drawing from nature) and gardening.

As our forests increase in size, so must forestry assume a greater significance for both town and country dweller. And because of this, and of the value of the country's forests as a national asset, we must, at the same time, encourage in the general public a realization of the importance of trees and of the need for their preservation from damage. In other words, we must work to develop a " forest sense ".

It is this kind of understanding that the Forestry Commission is hoping to encourage in schoolchildren by offering suitable forest sites of, say, 2-3 acres, for adoption by individual schools. The procedure is simple, and full details are given in a free leaflet* published by the Forestry Commission.

For schools which, for one reason or another, are unable to adopt a forest plot, the Forestry Commission will consider making gifts of up to 100 young forest trees for planting for study purposes in school grounds, or a smaller number for raising in pots.

**Selling the Pig** Twenty-four years ago, a commission was appointed to prepare schemes for improving the marketing of pigs in this country. Since then, the brush of time and circumstance has changed the picture. Production of pigmeat has increased; under the Agriculture Act, 1947, farmers are given guarantees and, last but not least, the nation has certain obligations in relation to international trade.

Against this background, the Reorganization Commission on the Marketing of Pigs and Bacon, appointed last year, has examined the present arrangements in the industry and, in its report, published last month, recommended the changes thought to be necessary.

The report demonstrates the contrast between conditions before the war and those obtaining today. In the early thirties, the pig industry was depressed; today it is prosperous. In 1955, Great Britain produced 190,000 tons of bacon; pre-war, the total was never more than 140,000 tons a year. Consumption of fresh and manufactured pork last year was 18 lb a head; it was 12 lb pre-war. But, says the report, the present appearance of prosperity and stability is deceptive in that it depends on subsidies paid under the Agriculture Act. These subsidies today run at an average of £2 million a month. The increase of production and consumption has been made possible

* *Starting a School Forest*. Obtainable from the Forestry Commission, 25 Savile Row, London, W.1, or from the local Conservator of Forests.

by the greater supplies of raw material brought forward by the subsidies. Yet, although the provisions of the Agriculture Act will endure, the Act does not require that subsidies should continue on the present scale. The Commission considers, therefore, that the pig industry's chief tasks are to reduce the costs of production, processing and distribution; and to improve quality, and the service to consumers, so that foreign competition can be faced without the need for substantial government support.

To that end, the Commission makes two main recommendations. First, that a Pig Industry Development Authority should be established by statute to draw up and implement a programme for improving pig production, processing and distribution. For this work, the Commission suggests that the Authority should have an income of between £500,000 and £1 million, to be secured by a levy on all pigs slaughtered. Second, that the pre-war marketing arrangements for bacon pigs should be repealed and replaced by new schemes for the negotiation of prices of pigs bought by curers. These would be administered by three bodies, a marketing commission of the Development Authority, a producers' board elected by pig producers, and a bacon curers' board elected by curers.

No statutory controls on the marketing of pork pigs are recommended. But the Commission considers that every farmer should have a real alternative to sale through fatstock auctions, and that if the farmer is to be in a satisfactory position as a seller in relation to the meat trades, further development of marketing by national and local farmer-cooperatives is needed. The Commission would also encourage the direct sale of a larger proportion of pork pigs to the trade on a basis of carcass grades. To cover the risk of the more serious price variations at individual markets, the Commission suggests that the Development Authority should explore the possibility of setting up a commercial insurance scheme. Finally, an improvement in slaughtering methods is required; the Government's new policy on slaughterhouses combined with the work of the proposed Development Authority should secure this.

The Commission considers that these arrangements for bacon and pork pigs are preferable to a producers' marketing board trading compulsorily in all pigs. They point out that if nearly all pigs were used for bacon (as in Northern Ireland) or, even, if all pigs were marketed at the same weight both for bacon and pork (as in Denmark) the answer might be a different one. But the nature of the demand for fresh pork in this country, and the organization for distributing pork to the consumer, make it probable that a marketing board handling all pigs would not work well.

The Government is to consider the recommendations of the Commission, together with those made by the Howitt Commission on the development of pig production. Mr. G. R. H. Nugent, Parliamentary Secretary to the Ministry, told the House of Commons on July 12 that the proposals would also be discussed with the interests concerned before any announcement could be made about future policy on pig production and marketing.

## IN BRIEF

### Toll of Farm Fires

Of all known sources of crop fires on farms in the United Kingdom during 1954, more than a quarter of them (328) were traced to children playing with matches. Rubbish and stubble burning and intentional burning of grassland, gorse, etc., started 208 fires, spontaneous combustion 158, smoking materials 132, and sparks from locomotives 124.

In farm buildings, incubators and brooders (all fuels) were responsible for 424 fires, nearly 25 per cent of all known causes. Here, too, children playing with matches were responsible for the second highest total (186). Grate fires and slow combustion stoves caused 146 fires, and electric fires, motors, cables, etc., 126.

The total number of farm fires of all kinds was 4,968, of which 2,196 were in buildings and 1,808 among crops.

### Bird Song

Practically everybody has been impressed at some time by the apparent learning ability of animals and, in particular, of birds. How often, for example, have you paused to marvel at the mimicking skill of the bullfinch? How far does instinct enter into it, and how much can be attributed to learning?

Dr. W. H. Thorpe referred to this question at a recent discussion on "Learning in Man and Animals", initiated by the Section of Comparative Medicine of the Royal Society of Medicine. Experiments show that a number of birds have their song patterns determined completely by heredity. In others, the song pattern of the bird brought up in captivity, although resembling in broad outline that of the free bird, lacks all the finer modulations and modifications. If such birds are raised in groups, they do learn to modify the original pattern until, finally, all the birds in the group produce patterns which are virtually indistinguishable from each other. These do not change even when later on the birds are exposed to the songs of free birds, and thus "group learning" may account for the well-known fact of local dialects in chaffinches.

Rigorous experiments with jackdaws made by Otto Köhler in Austria are also of interest in this context. In one group of experiments, jackdaws were taught to open a box having on it a number of dots corresponding with a number of dots on a key card. Great care was taken to vary the positions of cards and boxes, and the size, shape and position of the dots; in fact, to eliminate all possible clues except that of number. Under these conditions, it was proved conclusively that birds can compare groups of units and act in accordance with this information. The limit of this ability appeared to be in the neighbourhood of six or seven.

### Farm Figures

There are about 524,000 agricultural holdings in the United Kingdom: 315,000 in England; 55,000 in Wales; 73,000 in Scotland; and 81,000 in Northern Ireland. About three-fifths of the total holdings are under 50 acres in size, but 97,000 (18 per cent) are over 100 acres and 15,500 (nearly 3 per cent) over 300 acres.

**Fodder Beet instead of Mangolds**

So far, fodder beet has been used in Britain mostly for pigs, but the roots can also be fed to cattle, sheep and horses with advantage. Using Danish and Dutch experience, the recommendation for cattle feeding is about 50-60 lb daily of medium dry matter varieties for dairy cows, but not more than 35 lb daily of the high dry matter kinds, like Hunsballe, Pajbjerg and Hinderupgaard. These quantities correspond roughly to 70-80 lb of mangolds. Where fodder beet is being fed in quantity, it is advisable to include at least 7 lb of good hay per day in the ration.

Some farmers say that fodder beet doesn't seem to suit sheep, but others are finding that both the high and the medium dry matter types are a valuable winter food in place of mangolds, along with hay and corn for fattening tegs. In one experiment, a ration of 1 lb hay, ¼ lb corn mixture and 6 lb Red Otofte beet gave liveweight increases of 2-2¾ lb per week, with no adverse effect. For horses, a replacement of 4-5 lb of oats by 25-30 lb of roots can be made.

It is always important to introduce the fodder beet into the ration *gradually* to enable the digestive system to become adapted. Remember, too, that freshly harvested roots are more likely to give trouble than roots which have been properly stored and matured over several weeks.

**Help for Mid-Wales Farming**

The Government has decided to accept most of the recommendations made recently in the Welsh Agricultural Land Sub-Commission's report on agriculture in mid-Wales.

For a long time, farming has been a difficult job in this area, which comprises some 290,000 acres in Cardiganshire, Montgomeryshire and Radnorshire. The "drift from the land" has been marked, and some farmers in more remote districts have been selling their land for afforestation, summer grazing or amalgamation with other farms.

Amalgamation of the smaller farms, and afforestation of suitable land, are indeed the two main processes which the Government intends to encourage in order to create more stable conditions for agriculture in this area. Small farms are already being amalgamated in order to form more economic units, and this will be further encouraged by suitable grants under the Hill Farming and Livestock Rearing Acts. Principles have been laid down for the administration of the Acts in mid-Wales; the emphasis being on the suitability of the land for livestock rearing, and the exclusion of land which is more suitable for growing trees. The spending of public money on improvements will only be considered justified if it is going to result in the creation or continuance of an economic farming unit. This does not mean that the Government has overlooked the smaller part-time holdings which so often provide an entry into farming for the ambitious young man with limited capital. Although these farms will not be eligible for aid under the Hill Farming and Livestock Rearing Acts, suitable cases will, of course, qualify for other financial help.

Housing, electricity and water supplies will continue to be improved, and it is hoped that, when circumstances permit, the roads in the area will also be improved.

Although no special financial help is to be given to mid-Wales, the Government hope that the wise administration of existing facilities will prove effective in curing the ills of one of agriculture's less stable areas.

**Forestry Scholarships**

Training facilities for forest workers are now available in certain continental countries under the auspices of the International Labour Office. The Forestry Commission feels that the attention of landowners and others should be drawn to the scheme.

Briefly, the scheme provides for a limited number of scholarships granted by the International Labour Office for forest workers whose applications are sponsored by governments taking part in the Economic Commission for Europe and the European Forestry Commission of the Food and Agriculture Organization of the United Nations. The trainees selected are free to choose the course they wish to attend, subject to there being sufficient vacancies.

Courses are generally available in the following countries: Austria, Denmark, Finland, France, West Germany, Holland, Norway, Sweden and Switzerland. They vary in length from one to several weeks, and although instruction can often be given in English, a knowledge of the native language is, of course, an advantage. The emphasis of most of the courses is on felling, snedding, cross-cutting, peeling, extraction (by hand and horse), tool maintenance and the prevention of accidents. The use of power-saws for felling and cross-cutting is also taught in some courses.

The awards granted are:

1. A lump sum contribution of Swiss francs 150 (about £12) towards the cost of living, tuition, etc.
2. The cost of return second class travel from the trainee's home to the place of training.

Those interested should apply for details to the Secretary, Forestry Commission, 25 Savile Row, London, W.1.

**Another Kind of Test**

In Australia, a poultry improvement plan to reduce costs and improve output per bird was announced recently by the Commonwealth Minister for Primary Industry. The basis of the plan is the institution of a random sampling test. In addition to improving poultry breeds, better husbandry is to be encouraged by demonstrations of practices proved in the United Kingdom and other countries where egg production is higher than in Australia.

**Grassland on Colliery Shale**

The site of an old colliery spoil tip at Bickershaw has been successfully reclaimed to pasture by the Lancashire County Planning and Development Committee. Cattle are now grazing on what was, two years ago, a colliery spoil heap which had been derelict for nearly forty years. The Committee states in a report that the experiment has demonstrated an economic method of restoring this kind of land without importing soil, and that it may be economic for a farmer to do similar work with the help of marginal production grants. It is proposed to manage the land for about five years and to conduct a further experiment to determine the effect of variations of seed rates and other factors.

# BOOK REVIEWS

**The Squire and his Relations.** ESMÉ WINGFIELD-STRATFORD. Cassell. 42*s.*

The squire is essentially a product of English insularity. Whereas on the Continent the roots of feudalism struck deep and, in consequence, the rule of the seigneur, the boyar and the junker persisted for centuries, in England they were shallow, brittle, and thus more easily (and painlessly) removed as the liberty of the common people gathered strength from its yeoman stock. The squire was a part of the pattern of that evolving freedom, and the role which he played in giving form and cohesion to the structure of rural society was of significant importance to national stability.

The popular conception of the old squire presents him as a bluff, beneficent bucolic, enamoured of the thrills of the chase, a martyr to the delights of the table, and a figure both loved and respected by his cap-touching, curtseying tenantry. Is this romanticized picture fact or fiction? It cannot be denied that the imaginative novelists —Fielding, Addison, Steele, Surtees, Dickens and the rest—have blurred the outlines in the interests of story characterization. What were the squires really like, and what exactly has been their impact on our social and economic history? Clearly, they were not all out of the same mould, although all had a common purpose.

It is to these questions that Dr. Wingfield-Stratford addresses himself. The result is a scholarly, congenial book, deeply conceived and well presented. But at the end of four hundred pages the figure of the squire is still nebulous; it has proved too elusive for the author's pen. A number of examples of the old squires are called in evidence: men like George Osbaldeston, Sir Tatton Sykes, the Duke of Dorset, Coke and Viscount Chaplin; men, very like others in all stations of life, compounded in varying degrees of merit and human failing, yet for the most part accepting and discharging their inherited responsibilities justly and conscientiously. Six centuries of rural English history are passed in review. We see almost intangible penumbrations of squirearchy in medieval times, the new formulations of land ownership which came and developed with the Tudors, the consolidation during the seventeenth century, until, with the golden era of Georgian times, it blossomed and flourished in its full vigour, and thence to its decline at the end of the last century.

By any standard, Dr. Wingfield-Stratford's book is an informative contribution on a neglected facet of our social history. His researches have been deep and wide—too wide perhaps, since his interests and enthusiasms, although unquestionably interesting in themselves, often lead him to explore side issues instead of keeping resolutely to the main stream of the book's purpose. It seems that in another volume the author may bring his study right up to date, especially since he perceives in the present rural prosperity a resurgence among the country gentry of the spirit of the squires and the leadership of " The Hall ".

*S.R.O'H.*

**Cloche Cultivation.** G. B. WALKDEN. Collingridge. 9*s.* 6*d.*

In *Cloche Cultivation*, Mr. Walkden has tackled a tricky subject extremely well but, in my opinion, he will make an even better job of it when he comes to write the revised edition. There can be no quarrel with his treatment of the management of the cloches. He gives excellent advice upon all the points that puzzle the beginner—the varieties to grow, the planting distances, the planning of crop rotations and the rest. Neither is there any doubt that he is an enthusiastic and very knowledgeable craftsman in this sphere of gardening, and he succeeds in passing on that enthusiasm which every cloche gardener has for his pet horticultural sideline. For let us face it, even if one detests cloches, as many of us do, because they are so easily damaged, it must be admitted that the out-of-season crops which they permit us to grow are very sweet and welcome.

Where I think Mr. Walkden has failed us a little is in the very first chapter where he deals with the different types of cloche. He mentions five makers by name and describes their products. There are at least another five good cloches, and among them one which, from my own experience of twenty-five different kinds, I would not wish to be without.

I think also that Mr. Walkden should have discussed the question of tension on the glass, and the relative behaviour of plants under flat-topped cloches, compared with those with sloping sides. These comments apart, the book is excellent, and well worth the money.

*R.H.*

**Farming Advisory Services in North America.** The Nuffield Foundation. 4*s.* 6*d.*

In 1955, the Nuffield Foundation asked three prominent and progressive farmers, together with the Head of a Farm Institute and an administrator, to visit the U.S. and Canada in the June and July of that year, and to study their farming advisory services. The report of this mission makes a timely and well-informed contribution to the current debate in this country on the organization of our own advisory services.

Their report starts with an excellent geographical, economic, and social picture of American agriculture. The mission then devote chapters to the relations between, and the organization of, formal university teaching, agricultural research, and the official Advisory (Extension) Services in the U.S.A.; to the training, staffing, methods and effectiveness of these extension services; to the way in which the advisory work of the U.S. Soil Conservation Service, of the Farmers' Home Administration and other Government Departments, fits or does not fit into the extension picture; and finally to an outline of advisory organization in Canada.

In its final chapter the mission suggests that there are three aspects of American organization which could be fitted with advantage into the British scene. They are: "First, the integration of research, resident teaching, and advisory services. Second, the contributions from state and county sources, which give a local stake and interest in the work. Third, the method of planning the work in co-operation with the community, and then assessing and reporting progress towards the desired and designated goals." They continue: ". . . we believe that serious reconsideration should be given to the desirability of making the N.A.A.S. (as in Scotland) an extra-mural activity of university schools of agriculture." They also suggest that the activities of the Advisory Service should be more closely integrated with local county and rural district organization.

Those who know American agriculture may feel that if the mission had had time to dig deeper into the U.S. system, particularly at the farmers' level, they might not have been quite so positive in their conclusions. But whether or not their suggestions are regarded as valid or practicable, the sentiment of the mission's final paragraph cannot be disputed. In it they emphasize the strong pride and confidence that the American Extension Service has in itself and "its almost missionary zeal. This rather than the simple copying of some of its methods, out of context, seems to us to be the real lesson worth trying to imitate" in this country.

Copies of this report are obtainable from The Nuffield Foundation, Nuffield Lodge, Regent's Park, London, N.W.1.

*A.N.D.*

**Sweetacres.** A. G. STREET. Michael Joseph. 12*s.* 6*d.*

The power of the land over the men who own and farm, or merely inherit it, is the theme of Mr. Street's latest novel *Sweetacres.* Simon Avery's hatred of farming, his inheritance of his father's farm against his own wishes, and his subsequent conversion into an enthusiastic and well-respected farmer and countryman, offer Mr. Street plentiful opportunities.

He has scope for his singular ability to make the lay reader enter into technicalities and enjoy them, whether they consist of the ardours of fly fishing, the ritual of a rural auction, or the time and motion problems of combine harvesting. He writes with authority not only of farming practice in its narrow meaning, but of the social sense, sporting instinct, and commercial knowledge, the interaction of which makes up country life. His sketch of the countryside since the last war has a lively authenticity.

Mr. Street shows less mastery in this book over character and dialogue; and preoccupation with Simon Avery's lameness seems to inhibit the development of the main theme to the full. The hold of the land over its owner to make him do things he vowed he never would, and enjoy doing them, is essentially comic. Mr. Street obviously meant it to be, and he has shown in the past that he has a pretty sense of comedy. Concern for his lame hero seems partially to have eclipsed that sense, which, had it been allowed to play upon the situation of the reluctant farmer, might have put this book among his best.

These are nevertheless minor criticisms. The omission of love interest in *Sweetacres* is, perhaps, wise, but the story foreshadows a sequel and whets the appetite for more—a recommendation in itself. The book is bound to give pleasure to countrymen and the legion of country-lovers who have enjoyed Mr. Street's earlier works.

*D.P.B.*

# BOOK REVIEWS

**Agricultural Ecology.** GIROLAMO AZZI. Constable. 45*s*.

Agriculturists in Great Britain are very reluctant "splitters" and many, on reading the title of Professor Azzi's book may shy from it, murmuring something about "another new 'ology'". However, they need not be alarmed, for here we have a new presentation of part of the expanding subject which we have long known as Crop Husbandry. The subject is given a modern and precise definition that both the biologist and the agriculturist concerned with field experimentation may welcome.

Professor Azzi defines agricultural ecology as "the study of the physical character of environment, climate and soil in relation to the development of agricultural plants and to the yield of such plants in quantity, quality and reproduction". He is well equipped to bring these several aspects together for, since the early 1920s, he has been associated with agricultural meteorology in Italy and with the impact of climate on the yield of major agricultural crops. The outcome of his studies and his investigations is now available in this English translation of his book.

The subject is treated in four parts. Part I concerns climatology in relation to agricultural crops; Part II deals with the soil-climate relationships in the environment; and Part III with the crop plant and its reactions and responses to major changes in the environment, and to the minor or local changes that affect its reaction from farm to farm, field to field, or in different parts of the same field. In Part IV the author deals with the general subject of field experimentation and, taking maize and cereals in Italy as examples, he defines his comprehensive method for an analysis of the components of yield which takes into account not only several local aspects of climate and soil, but cultivation, fertilizer practice and the impact of pests and diseases.

A useful summary of "method" is included in the book and there is also a helpful glossary. The bibliography is a full one and is related to the chapters. The references, as might be expected, are largely to Italian authors, although there are some to American and Russian papers. But there is a noticeable absence of reference to papers by English workers, which suggests that we may be lagging behind in applying advancing knowledge in biology and meteorology to the growing of agricultural crops in this country.

Professor Azzi's book may well stimulate our thoughts in this direction and certainly it merits a place in our agricultural libraries.

*H.W.M.*

**Feeding Grass.** (Department of Agriculture for Scotland Advisory Leaflet No. 25). H.M. Stationery Office. 1*s*. 3*d*. (1*s*. 4½*d*. by post).

Too few stock farmers are making the fullest use of the potentialities of their grassland. In recent years emphasis has been laid on greater production from grassland by better management, by using improved strains of grass and clovers, and by more liberal fertilizer treatment. But all this is of little avail unless the increased production is used to maximum advantage in stock feeding. This leaflet sets out to help the farmer achieve that end.

The general nutritive characteristics of grass at different stages of growth are described with the help of suitable diagrams, and consideration is given to losses incurred in the various conserved forms—hay, silage and the artificially dried product. From these are derived calculations of the levels of milk production attainable for different grades of grazing. Thus it is shown that summer pasturage, properly managed, can readily sustain 4-5 gallons of milk daily from Ayrshire cows, and, in very favourable conditions, up to 7 gallons. Mention is made of a number of specific problems in dairy cows, such as bloat, grass tetany, scouring, and falling butterfat percentages. The value of conserved grass products for winter milk production is illustrated by tables giving appropriate basal rations. Attention is also drawn to the use of grassland products for young stock, stores and beef cattle. In addition, appendices deal with the use of the ration tables, the grading and feeding of silage, the grading of dried green crops, and the adjustment of silage quantities to varying moisture contents.

The feeding recommendations given may not find universal agreement. For example, most farmers would hesitate to feed 123 lb of marrowstem kale for fear of tainting the milk; and not many cows would consume 109 lb fodder beet daily without digestive upsets and scouring. Nevertheless, the general principles elaborated in the leaflet should prove useful to the farmer who is seeking to achieve the maximum output of milk from the acreage of grassland he has available.

Copies of this 21-page leaflet are obtainable from Government bookshops, or through any bookseller.

*A.E.*

# BOOK REVIEWS

**Corn on the Cob.** JOHN USBORNE. Hart-Davis. 9*s.* 6*d.*

Mr. Usborne opens his book with a brief survey of the history of maize (corn), its cultivation in North America and Europe, and a short description of hybrid seed production. He then proceeds to a detailed account of his adventures on his farm near Guildford where he tried out successfully the Dutch variety, Golden Standard. One year there was a set-back from wireworms, which destroyed almost all the seedlings, but this is not unusual when maize is planted in soil previously under grass. It is a little surprising, however, that no attempt was made to use soil blocks, which reduce attacks by Frit fly, wireworm and birds. Mr. Usborne experimented as he went along. Thus he interplanted tomatoes with young corn plants but found no benefit to either. Another conclusion he reached was that " given the right amount of nourishment in the soil, maize can thrive on less sunshine than formerly regarded as the lowest limit ".

Although, at first, the author misleadingly sold starchy maize ears for sweet corn, a visit to the U.S.A. convinced him that only true, sugary sweet corn, such as the John Innes Hybrid (Canada Cross), should be marketed. He also tested several hybrid American maize varieties (unfortunately obtained from southern states) which proved too late for English conditions. Still enthusiastic, he grew two varieties of pop-corn, one of which failed and the other " popped " only fifteen per cent.

The author enthuses about growing maize in Britain for animal feeding, but I doubt the economic advantage over good grass, in view of its specialized cultivation and the risk of erosion. There seems little point, too, in starting to investigate the value of feeding cobs to horses at a time when the number of these animals on farms is decreasing. Concluding this personal diary of experiences are two interesting chapters on cooking sweet corn and on recipes for using maize.

There are seven photographs. One shows maize varieties, the majority of which are stated to be unsuitable for England, while another, illustrating cobs, omits the two varieties which Mr. Usborne recommends. In the photograph of Golden Standard maize plants, the maize should not be confused with the globe artichokes that almost hide it. The diagram on page 51 loses its point for cross-pollination if maize is self-pollinated as stated.

This colloquial personal record serves a purpose if only by demonstrating that early varieties of hybrid sweet corn, Golden Standard, and a few very early American maize hybrids can be grown successfully in southern England, provided care is paid to cultural conditions and the damage by pests is overcome.

*G.H.*

**Teach Yourself Forestry.** T. A. ROBBIE. English Universities Press. 6*s.*

There has long been a need for a handy, cheap, yet comprehensive guide to the everyday tasks of the forester: the gap is now filled most adequately by this book. The author has added to an academic training in science several years of practical afforestation work and subsequently has had charge of a forester training school in Scotland. He appreciates what facts are really essential to the practical forester, and has set them down in clear, well-ordered prose, backed where necessary by helpful drawings.

After an opening chapter outlining the life history of a tree, the reader is introduced to the collection of tree seed, the raising of young trees in the nursery, their planting in woodland or on moorland, the tending of the resultant plantations, and, finally, to the felling of the grown trees and their preparation for sale as poles or timber. There are two chapters on the choice of the right tree for each type of ground, and several reference tables; but nothing is said on the financial or legal aspects of forestry.

Within these limits of space and scope, the main thing lacking is any information on trees and timber from the farmer's standpoint. The author has assumed throughout that his readers will be interested in the woods and the woods alone, whereas on every farm and private estate the relation of trees to agriculture, sport, and amenity are major considerations. At a time when it is being realized that forestry, in its right place, can give material benefits to both pastoral and arable husbandry, it is disappointing to find no mention of shelter-belts in a text-book of this kind. In any future edition, the space allotted to elementary surveying, on which many sound books are already available, might well be devoted to the value of trees on the farm. An outline of the grants available from the Agricultural Departments for shelter-belts, or from the Forestry Commission for planting small woods or poplar trees, would also increase the value of the book to the farmer.

*H.L.E.*

# BOOK REVIEWS

**Planning for Successful Dairying in New England.** RICHARD G. WHEELER and JOHN D. BLACK. Oxford University Press. 40*s*.

This book is a very interesting survey of the farming of New England, U.S.A., and discusses at great length the possibilities of reorganizing many of the farms of the area to increase profitability. It is, in effect, a farm management study of some 241 dairy farms. But what is perhaps more interesting is that not only has reorganization been suggested, but, in many cases, it has been started. Even though the full programmes may not have been implemented, the effects of the changes on profitability are clearly shown. Rarely before can such a clear picture have been painted of the advantages to be gained from sound farm management advice on so many farms.

The reorganizations suggested have included increasing the supplies of home-grown foods, improved ley farming and the utilization of silage from the leys, self-contained herds, the reassessment of buildings and equipment requirement, and, what may seem surprising, the need for more mechanization. Most of us have taken it for granted that, owing to shortage of labour, mechanization was already fully developed in the United States. It was also interesting to note that consideration was given to irrigation as a means of increasing home-grown food, and consequently of improving milk production.

Other possibilities of increasing profitability suggested were the introduction of additional enterprises, such as poultry and sheep farming (the latter seemed to have a detrimental effect on the finances of the farm, with the prices then prevailing), and of changing the cropping to include more cash crops, such as potatoes, vegetables, and even tobacco. The details of changes advocated and effected must be very much influenced by current prices, but the principles may be applied at all times.

Some may feel that this study of New England dairy farming will be of little value to British dairy farmers, but the conditions in New England are, in fact, not so very different from those found in the United Kingdom. Specialists in farm management problems should certainly read this book, and students could also peruse it with advantage. But it is a little doubtful whether farmers themselves would appreciate it, since it is rather long and probably too detailed.

*F.H.G.*

**Norfolk Agricultural Station. 47th Annual Report, 1954-55.**

Very high crop yields were obtained at Sprowston in 1954. Excluding experimental plots, winter wheat yielded 2¼ tons per acre—the highest ever recorded at the Station—barleys averaged 35 cwt., oats 30 cwt., sugar beet 12½ tons of clean beet, and vining peas 31 cwt. These figures are quoted in the recently published report of the Norfolk Station. Also included are some very interesting details concerning rations, cost of production and returns for Friesian bullocks reared on the farm from calfhood and finished at 20-22 months old.

Sprowston is now one of three experimental farms selected to test plant breeders' material in co-operation with the Plant Breeding Institute, Cambridge. The characteristics of a new winter oat variety and two new malting barleys (Maythorpe and Provost), which are under test there, are described. Details are also given of experimental results for different row widths, seed rates, and levels and time of applying nitrogen top dressings to winter and spring wheats.

Work on the chemical control of weeds in sugar beet indicates the usefulness of nitrate of soda post-emergence sprays, when used with a wetting agent and in conjunction with some hand weeding to complete the kill, and of the value of certain chemicals (PCP, TCA and CDED) against wild oat, when a few pounds per acre are worked well into the seedbed before drilling.

Other investigations with sugar beet mentioned refer to the reduction of labour requirements in the spring, the search for a better grade of rubbed seed, the use of precision drills, methods of improving field emergence, mechanical thinning, and trials in collaboration with Rothamsted on the use of systemic insecticide sprays on beet to control the aphid vector of Virus Yellows. Similar trials under this last head are in progress at Sprowston on potatoes, with the object of reducing Potato Leaf Roll and Virus Y.

The final point of interest in this report is one for the future rather than the present, as the Station has now undertaken, by arrangement with the Ministry, to conduct *ad hoc* field experiments as required, in conjunction with similar work at the Ministry's Experimental Husbandry Farms.

Copies of the report may be obtained free from the Norfolk Agricultural Station, Sprowston, Norwich.

*A.J.L.L.*

## BOOK REVIEWS

**Agricultural Discs.** (British Standard 2687: 1955). 2*s.* 6*d.*
**Dimensions of Agricultural Cultivator Tines.** (British Standard 2659:1955). 3*s.*

The extraordinary variations in size and type of wearing parts in cultivation implements has for years been a source of frustration, annoyance and unnecessary expense, both to the farmer and the local agricultural engineer. The advantages of standardization have long been spoken about, but the difficulties of arriving at any practical solution acceptable to the many interests involved are, of course, very great. The Agricultural Machinery and Implements Industry Standards Committee is therefore to be congratulated on the production of these two standards.

B.S.2687 is noteworthy in that it defines the dimensions of four types of flat and concave discs, and also sets out the minimum quality of steel used. Yet when I find that it makes provision for nine flat discs, ten concave " type A ", six concave " type B " and seven " type C ", I cannot help wondering whether the reduction in numbers has been sufficiently drastic.

The procedure in B.S.2659 is rather different. This Standard defines the shape of the tine, accommodating a range of points for all purposes. The quality of material is not specified, since strength depends so much on the design of the complete implement. The main objective is to achieve interchangeability in the fit of points on a range of tine types. All farmers will welcome this with acclamation.

It is hoped that both standards will be adopted by the trade forthwith. Benefits to farmers should result from the lower costs due to rational production of implement parts and the considerable reduction in the stocks of spare parts held by local agricultural engineers.

Copies of these Standards may be obtained from the Institution, 2 Park Street, London, W.1.

*H.T.H.*

**Readers' Guide to Books on Agriculture** (2nd Edition). The Library Association. 1*s.* (1*s.* 2*d.* by post).

Compiled by a librarian, in co-operation with the staff of the West Midland Province of the National Agricultural Advisory Service, this booklet is No. 4 in a new series of select bibliographies now being published by the County Libraries Section of the Library Association.

The guide, which comprises 75 pages, lists many of the available books, bulletins and periodicals on agriculture. Arranged in 10 parts, under such headings as " Background to Farming " and " Agricultural Economics ", it is subdivided into 50 sections, the entries in each section being listed alphabetically under the author's name.

Copies of these standards may be obtained from the Institution, 2 Park Street, Library, or from the County Library, Widemarsh Street, Hereford.


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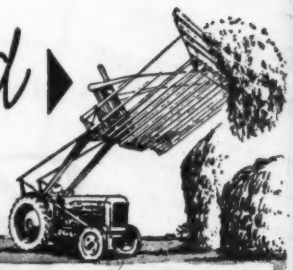

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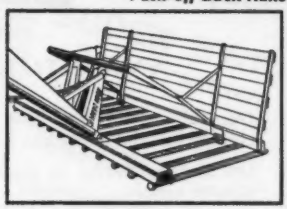

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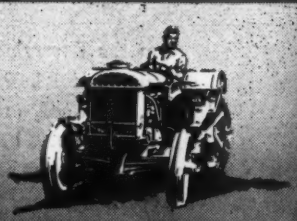

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